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INSPECTION METHODS Under Buick's New Program

By CHARLES N. OFIELD, General Chief Inspector Buick Division of General Motors Corporation, Flint, Mich.



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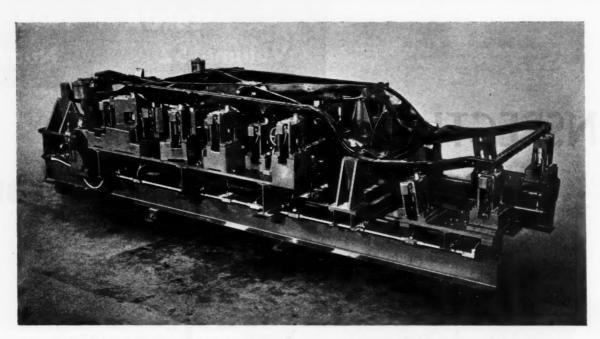


Fig. 1. Inspection Fixture Developed for Checking All Important Dimensions on Automobile Frames, so that Bodies can now be Doweled to These Frames. Buick Automobile Frames are Checked 100 Per Cent in Fixtures of This Type

From this humble start the well developed modern inspection system has been created, with complete quality control over the product components, from the time they are received as raw, semifinished, or finished material until the complete product has been shipped from the plant.

In the early days of the Buick organization, each operator was his own inspector and each supervisor was a guardian of quality. However, as the organization grew, a point was reached where a separate operation of inspection was set up in an attempt to improve work quality and reduce costs due to scrap and excessive work repairs. The inspectors reported directly to productive supervisors in their respective departments. A few more years passed, and in trying to coordinate the quality of the work turned out by all departments to a point where the products of each group would fit together to produce an economical and yet high quality assembly, a position of chief inspector was created for each factory. The chief inspector reported directly to the factory superintendent.

This system was a big improvement over the older systems in that the chief inspector, being familiar with all operations and parts, including assembly, was able to make intelligent decisions concerning parts deviating from blueprint specifications before they were completed or assembled.

Finally, to standardize methods of inspection, quality control, methods of reporting scrap, and so on, all inspection for the entire Buick Division

was consolidated under one head. The person holding this post is responsible only to the top management of the Division for the conduct of his department, and this is the inspection organization of today.

The Buick inspection division operates on the principle that the success of any manufacturing organization is dependent upon customer satisfaction, and that this satisfaction can be maintained only through complete quality control of its products. Other objectives are (1) to observe that finished parts assemble properly; (2) to guard against the natural tendency of manufacturing departments to lower work quality standards under the pressure of intensive production; (3) to observe individual manufacturing operations frequently enough to prevent excessive spoilage of work; (4) to prevent additional labor on work already spoiled; and (5) to determine machine and process troubles, and detect lack of skill on the part of machine operators.

It would be economically impossible for an inspection department to function alone in the attainment of a high quality complex product. Therefore, the inspection department must be carefully organized so that it will demand the respect of and obtain active and harmonious cooperation from all departments. It is a known fact that those manufacturing departments in which the machine operators, production set-up men, and foremen insist upon a thorough and proper use of the gages pro-

vided definitely show a low percentage of scrapped and reworked parts.

Primarily, the quality of a product depends upon the engineering specifications and the efforts of the manufacturing division to adhere to them. It depends only secondarily upon the ability or the efforts of the inspectors to detect faulty products. Most manufacturing errors are of a repetitive nature; successful inspection and production cooperation can be judged by the success in holding these errors to a very low frequency rate.

The inspector must realize that his duty is primarily to prevent trouble rather than the detect it, and it is his job to help the manufacturing department turn out good materials and good workmanship rather than to proclaim their failure. The fewer the rejected parts and repairs, and the less the amount of scrap, the greater is the indication of cooperation and harmony between the inspection and production departments. This is a credit to both departments.

Inspectors should be as interested in the quantity of work going through the department as is the foreman, and they should be equally concerned in maintaining the necessary quality. If the foreman will consider quality standards his responsibility also, and instill in the minds of his men the need for proper and constant use of the gages provided, he will automatically reduce scrap and repairs and will, in turn, remove the necessity of excessive inspection in his department.

Advancements in Buick inspection for the post-war have been mainly in the direction of more complete gaging of work parts. In many instances, parts that were previously spot-checked only or inspected on a small percentage basis are now checked 100 per cent. This complete inspection is in most cases performed as quickly as the previous spot inspection through the use of modern electric gaging equipment, which instantly indicates the accuracy of all important elements on a work-piece. Each piece is inspected in identical manner because of the elimination of the human element. Gaging equipment of this type is shown in the heading illustration, and will be discussed in detail subsequently.

One of the greatest inspection time-savers is the gaging fixture illustrated in Fig. 1, which was built

Fig. 2. View of One of the Indicators on an Automobile Frame Gaging Fixture, which Shows whether the Height of a Surface is within Specified Limits

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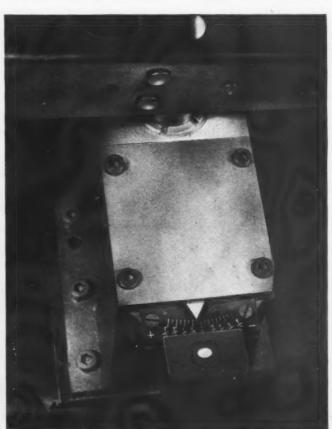
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Fig. 3. View of Another Indicator on the Frame Gaging Fixture with the Pointer at the Left of Zero, Showing an Error in Height of 1/16 Inch



for checking all important dimensions on automobile frames, including the location of all bolt-holes and the heights of various surfaces with respect to each other. This is believed to be the first such gage in the automobile industry. Each frame is located in the fixture for height first of all, but the fixture is also provided with four pilot-pins at the two ends that register with doweled holes in the automobile frame for locating purposes. In addition, there is a central post against which a gusset plate on the automobile frame registers. After a frame has been located from these pins and the central post, all bolt-holes in the cross-member, side rails, and front-suspension mounting plate should be in direct line with hydraulically operated plug gages. The latter are raised vertically or at the required angles in unison by the operation of a control valve. Air pressure is applied in back of the oil in the line leading to the gage operating cylinders.

There are twenty-five of these gaging plugs. Each of them is contained in a sleeve. The sleeves are raised with the gages, and the upper end of each sleeve should come in contact with the under side of the frame at a specified height in relation to located points on the frame.

A dial indicator of the type seen in Fig. 2 and a control box with an electric light bulb are provided for each gaging location. If the surface being checked by any gage sleeve is at the specified height, the corresponding indicator will register zero, as shown in Fig. 2. If the surface is too high, the indicator will register to the left of the zero graduation an amount corresponding to the inaccuracy, as shown in Fig. 3. When the automobile

frame surface being checked is low, the indicator will register to the right of the zero mark. Each graduation on the scale represents an error of 1/16 inch.

When the location of the hole being checked by any of the hydraulically operated plug gages is correct, so that the gage can enter the work hole, as shown in Fig. 2, the light on the corresponding control box flashes on. In cases where the work hole is not in direct line with the gage, the corresponding electric bulb remains unlighted. By observing all gaging units, the inspector can immediately tell whether or not the location of all important holes and surfaces of the automobile frame are correct. The gaging plugs are 1/16 inch smaller than the holes in the frame. The lights are controlled by micro-switches, and the indicators are actuated directly from the sleeves surrounding the gages.

Two of these frame gaging fixtures are employed. Each fixture is adjustable to handle the automobile frames of two car models. Thirty frames can be completely checked per hour, whereas by the previous method, in which frames were set up on a surface plate, it took two men thirty-two manhours to check a single frame. Obviously, with that procedure it was impossible to check frames 100 per cent. The gaging fixtures described now make this practice possible. For the first time it is now practical to dowel automobile bodies to frames.

A master gage is employed to check the gaging fixtures periodically. This master is seen above the fixture in Fig. 4. If inaccuracies develop in a fixture, adjustments can be made to compensate.

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Fig. 4. Another View of an Automobile Frame Gaging Fixture, with the Master that Provides for Checking All Gaging Elements Suspended above it



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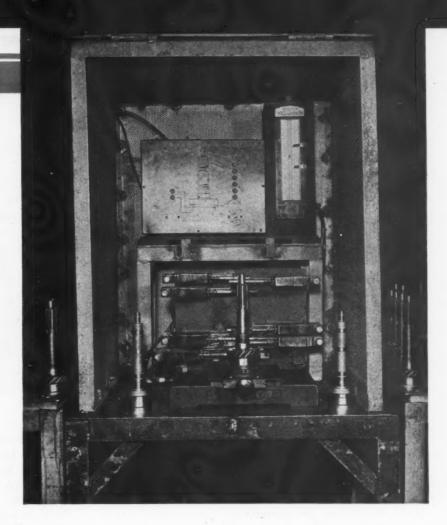
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Fig. 5. An Inspection Operation in which a Multichek and a Precisionaire are Used in Combination for the Complete Inspection of Main-drive Gears



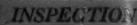
All important dimensions on the main-drive or clutch gear are simultaneously inspected by employing a Multichek multiple gage instrument in combination with a Precisionaire pneumatic gage. A close-up view of these instruments is seen in Fig. 5, and a general view is shown in the heading illustration. Seven different external diameters and two heights are instantly gaged by the Multichek, while the diameter and roundness of a bearing hole in one end are checked by the Precisionaire instrument seen at the upper right in Fig. 5. Two pointers on this device are set about 2 inches apart, this distance indicating a difference of 0.0008 inch in the dimension being gaged.

Compressed air from the regular plant supply line is admitted to this gage through an automatic compensating pressure regulator. The air passes through the vertical transparent indicator tube and out through an orifice in the gaging spindle on which the main-drive gear is placed for inspection. In this way, an air column is produced in the indicator tube. The volume and velocity of air flowing through the tube at any given instance during a gaging operation depend upon the clearance between the gaging spindle and the sides of the bore being inspected. The greater this clearance, the higher the velocity of the air passing between the spindle and the internal surface of the bore, and, of course, through the transparent tube.

An indicator float in the transparent tube is free to move up and down in response to changes in the velocity of the air. The greater this velocity, the higher the float rises in the tube. In order for a gear to pass inspection, the float must be positioned between the two pointers when a gear is placed on the gaging spindle. The close-up view in Fig. 8 clearly shows the gaging spindle and the orifice through which air is allowed to escape from the system which supplies the Precisionaire instrument. The gear is revolved around the gaging spindle to determine out-of-roundness.

The Multichek unit consists primarily of a rightangle chassis on which are mounted a number of gaging heads on modified snap frames. These gaging heads utilize the sensitive, mechanically positive Reed mechanism, and operate on electric current. There is one of these heads for each dimension to be inspected. The arrangement of the snap frames for the main-drive gear is clearly shown in Figs. 6 and 8. A light panel above the gaging heads carries a diagram of the work part, together with a set of signal lights, one for each dimension.

Each gaging head actuates a green and a red light bulb, which are mounted behind a common port on the light panel. When the red bulb only is lighted, it is an indication that the dimension being checked is under size. When the green light only is lighted, the dimension is over size. When both bulbs are lighted at the same time, they produce an amber color, which indicates that the corresponding dimension is within the specified toler-



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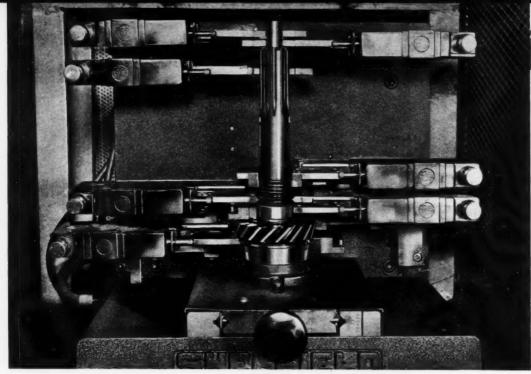
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ance. Thus the inspector can tell at a glance which dimensions are within the specified tolerance and which are not.

Some of the dimensions of the main-drive gear are held to a total tolerance of 0.0005 inch, while other dimensions are permitted a tolerance of 0.002 to 0.010 inch. The gaging spindle is mounted on a slide which is pulled forward to disengage the work from the gaging heads after inspection. It is pushed back to bring a new main-drive gear into contact with the gaging heads. At the right and left in Fig. 5 may be seen masters for adjusting

the gaging heads of the Multichek and the indicators of the Precisionaire. Since this gaging equipment was provided it has enabled efficient 100 per cent checking of all dimensions of maindrive gears.

Multichek gages are employed in the manner shown in Fig. 7 for inspecting the diameters and widths of the ring grooves on pistons, as well as the distance from the lower edge of the bottom ring groove to the skirt end of the piston. Four diameters and five widths are checked, as will be apparent from the diagram on the light panel. The

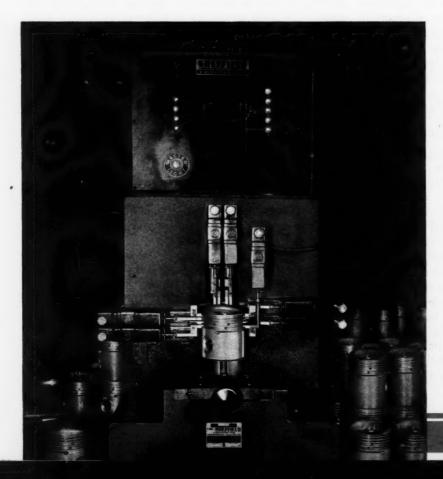


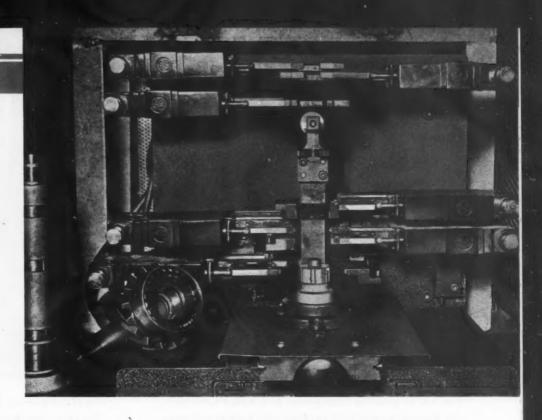
Fig. 6. (Above) Closeup View of the Multichek Shown in Fig. 5, Illustrating the Manner in which the Various Electrichek Gaging Units are Applied to the Work

Fig. 7. (Left) Nine Important Dimensions Pertaining to the Ring Grooves of Pistons are Simultaneously Checked by Means of the Multichek Unit Here Shown

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Fig. 8. Another View of the Multichek Shown in Fig. 5, with the Work Removed to Give a Clear View of the Gaging Spindle and the Various Gaging Heads



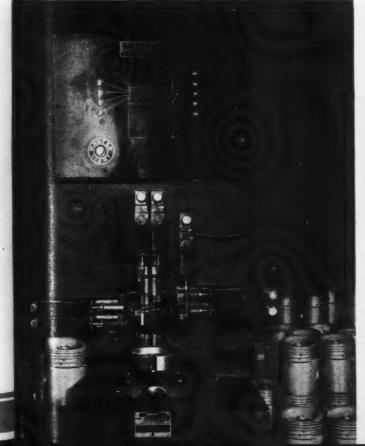
same gaging unit is shown in Fig. 9 without a piston on the slide, so as to give a clear view of the snap frames at the back. The widths of some grooves are held to a tolerance of plus or minus 0.001 inch, while others are held to plus or minus 0.0006 inch. The diameters must be as specified within plus or minus 0.0005 inch.

Another Multichek gage is used for checking

the taper on the skirt of the piston and the diameters of the lands between the ring grooves. Tappet valves and many other types of work are also inspected by the use of Multichek instruments. The set-up for checking tappet valves is illustrated in Fig. 10. Five diameters and two heights on the valves are inspected, as will be seen by reference to the diagram on the light panel.

Fig. 9. View of the Multichek Shown in Fig. 7, with the Work Removed from the Slide to Permit the Arrangement of the Gaging Elements to be Seen

Fig. 10. Multichek Inspection Instrument Set up for Checking Automobile Valve Tappets. Five Diameters and Two Heights are Checked at One Time







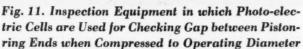




Fig. 12. Close-up View of the Piston-ring Inspection Machine Shown in Fig. 11, Illustrating the Method of Holding the Piston-rings during Inspection

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Photo-electric cells provided on the instrument shown in Fig. 11 facilitate checking the width of the gap between the ends of piston-rings, with the rings compressed together in the same way as they are when assembled in an automobile cylinder. It also checks the trueness of the periphery. For this inspection, the ring is inserted in an internal groove in a master ring of correct dimensions, such as seen at the left in Fig. 12. The master ring is then placed on the instrument table and rotated by a roller driven by an electric motor.

The gaging functions are performed by three beams of light directed on three photo-electric cells which energize electronic circuits to illuminate three signal lights. As the master ring is revolved, one beam of light is projected on the periphery of the piston-ring. A clearance between the piston-ring and the master ring will result from any outof-round condition of the piston-ring, permitting
part of the light beam to fall on the photo-electric
cell. This cell is set to actuate a red-light rejection
signal if an excessive amount of light indicates
that the piston-ring is out-of-round beyond the
acceptable limits. If the periphery is within the
required limits, a green light flashes on at the end
of one complete revolution, provided the width of
gap is also within tolerance. The beam of light
is interrupted by a mechanical shutter arrangement at the time the gap is passing this point.

Another beam of light scans the width of the gap, the photo-electric cell being set to actuate a yellow light should the gap be under size. A third

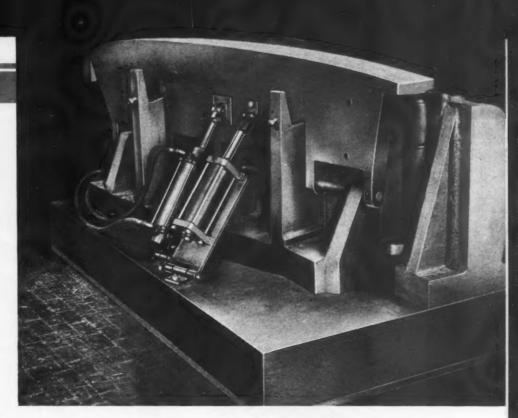


Fig. 13. Inspection Fixtures have been Developed to Insure Accuracy of Contour Lines where Front Fenders Fit the Automobile Doors, Engine Hood, and Radiator Grille. There are Similar Fixtures for Rear Fenders

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Fig. 14. Rear View of Fender Inspection Fixture Seen in Fig. 13, Showing Mechanism Employed in Operation of a Hinged Leaf which Carries a Gaging Edge



light energizes another photo-electric cell, set to illuminate the red rejection signal light should the width of gap be over size.

Master piston-rings of known dimensional accuracy are used in adjusting the instrument for the desired tolerances. The instrument can be adjusted within limitations to check gaps of varying widths and also for allowable variations on out-of-roundness of the periphery. Trueness of ring periphery can be determined within a tolerance of 0.0002 inch.

It is the practice to turn on all the lights of this equipment for at least thirty minutes before inspection is started, so as to insure that the instrument will be properly warmed up. Inspection will then always be performed under uniform conditions. The lights and the motor that drives the table are controlled by switches on the right-hand side of the housing.

Unique gaging fixtures have also been developed for checking fenders to make certain that they will fit closely the lines of the door, engine hood, radiator grille, and so on. One of these fixtures, designed for the right front fender, is illustrated in Fig. 13. Through 100 per cent inspection of fenders in fixtures of this type, fender fitting troubles have been eliminated along the automobile

assembly lines.

A fender is located in this fixture over a form which fits the under side of the fender and on a stand that supports the fender above the wheel cut-out. Two dowel-pins on the fender are entered into holes in the flange along the engine hood line.

After a fender has been seated in the fixture, the heavy hinged plate at the rear, which is illustrated in Fig. 14, is swung upward to bring a gaging edge into close alignment with the hood line to be checked. The supporting flange previously mentioned extends beyond the hood line at a lower level.

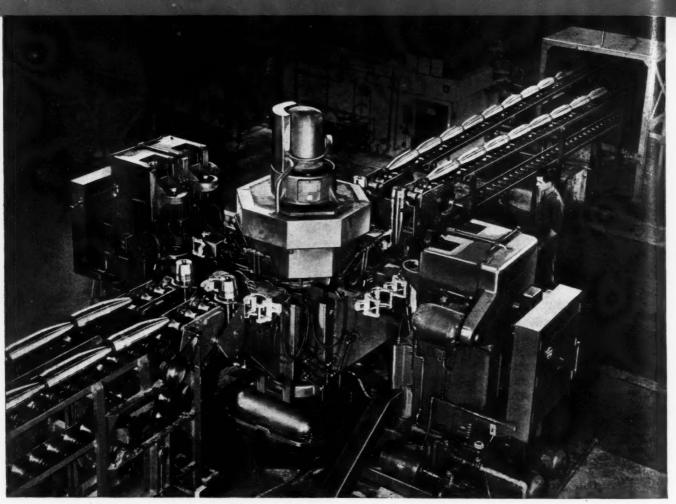
The hinged plate is raised by means of the air cylinder seen at the left. The cylinder at the right contains hydraulic fluid and serves as a buffer when the air valve is released, thus preventing the heavy leaf from dropping too fast. Fig. 15 shows how the fixture is used for checking the contour of the fender line where it joins the radiator grille. There is another somewhat similar gaging fixture for front fenders that is employed for checking the location of punched holes. Plungers attached to the fixture are entered into these holes.

Fig. 15. View of Front Fender Inspection
Fixture, Showing Method of Checking Contour

of Fender where It Joins Radiator Grille



The Automatic Manufacturing Plant N



A Group of Two Threading Machines with a Robot Mechanism in the Center for Automatically Loading and Unloading Them

ANY of the wartime developments will have a profound effect on the manufacturing practices employed in making peacetime products. Bold and ingenious ideas that would hardly have received a hearing in peacetime days won acceptance in the wartime emergency because of the urgent demand for more and ever more war materiel. A wartime idea that successfully materialized was the 155-millimeter high-explosive shell plant that was designed and built by the W. F. & John Barnes Co. during the latter months of the war and was just ready to be placed in operation when the fighting ended. This plant may well be termed an automatic mass-production factory. Here heavy parts, weighing in excess of 125 pounds, are handled mechanically from the time the billets enter the heating furnaces until the completed shell, after having passed through all machining, heat-treating, and other operations, is ready for

This plant was conceived and built by the executives, engineers, and production men of both the Machine Tool and Ordnance Divisions of the

Barnes organization. Without the complete cooperation of these groups, the results accomplished could not have been achieved. The Barnes organization not only engineered the plant, but engineered and built the bulk of the special machinery, and worked with the engineers of other concerns that supplied special equipment, offering them engineering ideas as to what would be required, and then working out the details with the supplying companies' engineers.

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The present article will briefly describe the essential equipment in this automatic shell-manufacturing plant, not with the idea of presenting a treatise on shell manufacture, but rather of showing the possibilities of this type of manufacturing plant as applied to peacetime mass production.

It should be noted that in the design of the facilities of such an automatic plant, all ideas must begin to take form with the building itself. A system of intercommunicating trenches and tunnels is incorporated to carry all of the various services and to provide for the automatic handling of chips. Even the foundations are designed with a view to

Mass Production Shop of the Future

A Plant Designed and Built by the W. F. & John Barnes Co. During the Latter Part of the War for the Manufacture of High-Explosive Shells Suggests Possibilities for Mass Production Plants for Peacetime Manufacturing that will Practically Constitute a Single Automatic Unit

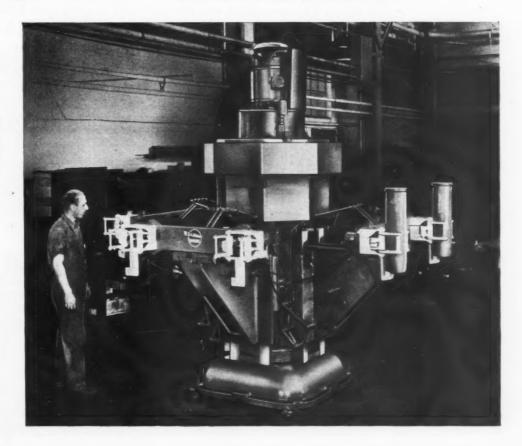
By ERIK OBERG, Editor, MACHINERY

the ultimate purpose of the plant, and are tied in with the main tunnels to provide easy access for maintenance of the services and for proper plant housekeeping. Special attention is given to the exhausting of fumes and gases and to the maintenance of suitable shop temperatures. As an example of the latter considerations, it might be mentioned that in the forge shop a full-length roof ventilator is coupled with louver control of windows at the floor level, in order to reduce the temperature in this area and to provide the best possible working conditions.

In the design of the shell plant referred to, it was kept in mind that practically all manufacturing operations would be performed by women, and hence, to facilitate the operations, the controls were largely through push-buttons.

To avoid the manual handling of the shells, two fundamental types of equipment were providedfirst, a complete conveyor system for transferring the heavy projectiles from operation to operation; and, second, a machine, on the success of which hung the entire handling process—a mechanical robot that would pick the shell (or other part) from the conveyor, load it into the machine, and upon the completion of the machining cycle, remove it from the machine and transfer the machined part to an outgoing conveyor. By synchronizing the motions of this mechanical robot with those of the machine through electronic, hydraulic, and mechanical controls, it is possible for one operator-either man or woman-to obtain a production from the machining equipment that has been unheard of in past performance.

Fig. 1. Typical Robot Mechanism Used to Automatically Load and Unload the Equipment that Performs Machining Operations on the Shells



THE AUTOMATIC MANUFACTURING PLANT

Since the success of an automatic plant such as described hinges upon the possibility of handling heavy forgings or machined parts without the touch of a human hand and of loading and unloading the machines automatically, the robot mechanism will be referred to first. Fig. 1 shows a typical mechanism of this kind used for automatically loading and unloading shells in the operation of a four-station center-column machine.

This robot mechanism consists of a base on which is mounted a rotary four-sided center column. On each of the four sides of the column is mounted a vertical slide which serves to bring the shell or other part into and out of the holding fixtures in the machine. On the top of each of these slides, horizontal ways have been machined which carry the mechanical hands that transport the shell to and from the conveyors and in and out of the machines. Briefly, the operation of this mechanism is as follows:

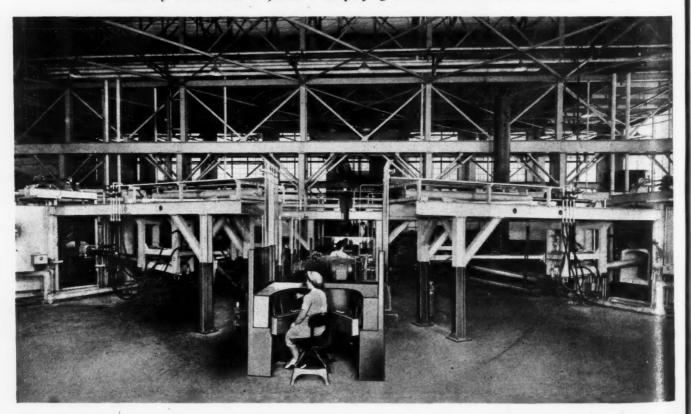
The mechanical hands advance toward the incoming conveyor, and each hand clamps a shell. Then the mechanism and slides move back toward the center column of the machine, withdrawing the shell from the conveyor. The robot machine is now indexed, and the hand slides advance into the ma-

chine that is to perform an operation—in this case a rough-turning machine. The vertical slide next moves upward so that the open end of the shell, properly faced square in a previous operation (in this case in a centering and cutting-off machine), moves over an internal mandrel against the spindle shoulder. The tailstock then moves into the machined center in the base of the shell, after which the mechanical hands are released. With that release, hydraulic pressure expands the jaws of the internal mandrel, clamping the shell for the turning operation. The vertical slide now moves downward, the hand slide moves toward the column of the loading machine, and the process is reversed for another loading operation.

When the shells have been rough-turned, the robot reverses its loading procedure by moving in empty, picking up the finished shell, indexing to the proper position, and releasing the roughturned shell to the outgoing conveyor. The operation of removing the shell from the conveyor and loading the machine, or the unloading of the machine and depositing of the shell on the outgoing conveyor, requires thirty seconds.

It will be noted that one robot serves two machines and that one woman operator controls the

Fig. 2. View of the Furnace Room of the Forge Shop Showing Two 28-foot Salem Rotary Furnaces which are Automatically Loaded with Billets and Unloaded by Two Women Operators Employing Push-button and Lever Control



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Fig. 3. Electric Control Board for the Operation of a Group of Two Machining Units and One Loading Unit

three pieces of equipment. It is estimated that the production from this unit of three machines is approximately ten times the production of the same personnel using standardized shell-

turning lathes.

Another point that was considered in the entire engineering of the plant was the control of the movement of the shell so that it was never necessary to dump coolant out of the inside of the shell. In some automatic arrangements for shell turning, there are specific operating stations arranged merely to turn the shell upside down, so as to throw out the coolant. This is not necessary if the shell is moved through its various operations with the nose downward.

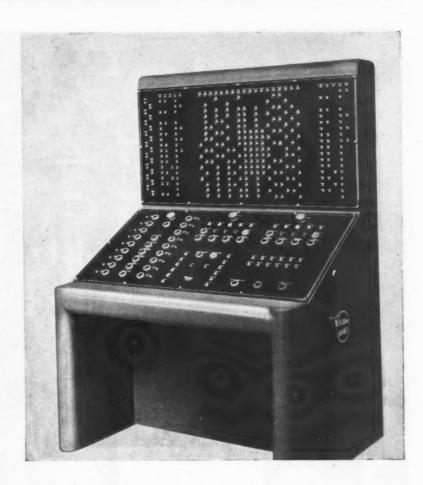
While a robot mechanism of the type suitable for the work to be handled is perhaps the basic conception in an automatic manufacturing plant such as described, there are many other unique features in the production line that aid in making all the operations completely

automatic. These features, as employed in the manufacture of shells, will be briefly reviewed in the following two paragraphs, but it should be noted that with slight variations they can be applied to a great variety of mass production parts.

In the shell-manufacturing plant here described, there is an automatic pallet mechanism for loading the heat-treating furnaces; there is a complete control of the hot nosing operation, by which perfect alignment and temperature control can be maintained; there is a system of production-line gages for checking all important items as the shell moves down the production line; there is a unique method for banding that insures an absolutely gastight fit of the band on the shell; and there are automatic features applied to the control of gages, tools, cutting compounds, and all other elements entering into the manufacturing process.

This control of gages and tools could be greatly elaborated upon, since it constitutes one of the important features in the success of this type of automatic manufacturing plant. The shell, for instance, as it progresses down the conveyor line, is automatically lifted into an electronic gaging device. The gaging is performed, and in some cases recorded on a chart, after which the shell is automatically placed back on the conveyor.

In the case where the manufacturing processes



begin with forgings, the success of an automatic production line depends materially on the weight, accuracy, and treatment of the forgings. Even the forging operations can be so engineered that the manual handling of billets and forgings is eliminated and push-button controls are provided for the main processes, including the operation of the rotary furnaces, forging presses, and similar equipment. As a result, in the shell plant described, the operation is so thoroughly automatic that all handling of the material at the heating furnaces is controlled by a girl at a push-button station.

Details of Operation of the Heating Furnaces in the Forge Shop

Fig. 2 shows two 28-foot Salem rotary furnaces used for heating billets in preparation for forging. In the center may be seen two women operators seated in front of control boards, by means of which the furnaces are automatically loaded with billets and the heated billets automatically removed and transferred to conveyors. Briefly, the operations are as follows:

The billet, cut to the proper length, is automatically conveyed to the entrance door of the furnace. A woman operator, seated at the control board, handles, through push-button and lever control, the

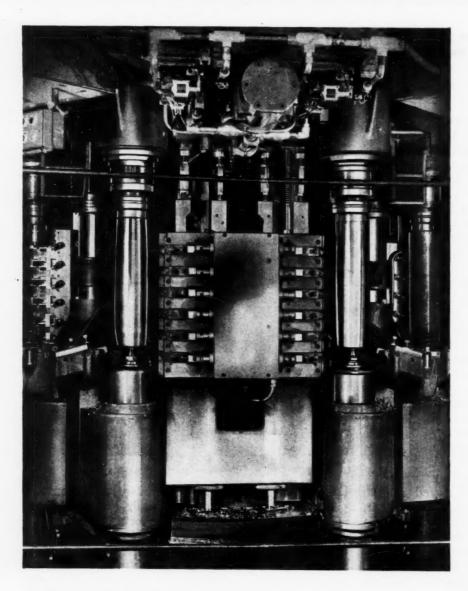


Fig. 4. Close-up View of Tooling of a Barnes Four-station Centercolumn Machine Used for Roughturning the Forgings

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same as described for the loading process, except in reverse.

The woman operator who controls the automatic unloading of the heated billets also controls the indexing of the hearth. Obviously, it is important that the billets be unloaded when they have reached the proper forging temperature; hence the removal of the billets from the furnace and the indexing of the hearth are tied together.

The hot billets are unloaded onto a conveyor which delivers them to a water scaling operation under 2000 pounds of water pressure. The descaled billet is then transferred by conveyor to a preliminary sizing press prior to piercing, all of these operations being automatic like the rest of the installation.

Electric Control Board for Operating Center-Column Machines

One of the most interesting features of this entire automatic manufacturing plant is the ingenuity displayed in providing

automatic control of the turning, boring, and threading machines. The control board (Fig. 3) is taken care of by one woman operator, who controls the operations of two four-station centercolumn turning machines. Two machines of this type are placed facing each other, with an automatic loader between the two machines, similar to the arrangement shown in the heading illustration. The machines are designated left-hand and right-hand machines, according to their relation to the automatic loader. A left-hand and a right-hand machine and an automatic loading machine are referred to as a group. A control panel, such as shown in Fig. 3, is provided for interlocking and controlling each group of machines. A system of lamps and push-buttons is assembled in this control desk, with indicators showing the operating conditions of the group of machines, and providing means for controlling their operation.

The lamps on the control desk are wired so that

loading of the billets into the furnaces. By the operation of these levers and push-buttons, the following cycle is controlled: The jaws of the ram clamp a billet at the end of the conveyor. The furnace door opens; the ram advances into the furnace to a predetermined position, and the billet is deposited on the floor of the rotary hearth. Next the ram withdraws from the furnace and the operation is repeated until four billets have been placed in the furnace. The furnace door is then closed and the rotary hearth is indexed, ready for loading another group of four billets. All of these operations are performed automatically, with one woman operator controlling the loading of both the rotary furnaces.

The woman operator shown seated at the control booth in the background of the center of Fig. 2 controls the automatic unloading of the heated billets. The unloading of the hot billets and the control of the ram and door mechanism are the

MASS PRODUCTION SHOP OF THE FUTURE

they will burn at a low voltage when not picked up by the circuit controls. In that way, the operator will know that a lamp that is not lighted is burned out. A selector switch is provided so that the operator can turn off all lamps showing the control circuit condition when they are not in use.

The upper panel on the control desk contains a system of lamps that will show the operator the condition of the control circuit if the machine stops during the automatic cycle or fails to perform one of its operating steps during a hand-operated cycle. This indication will localize any trouble in the machine controls, thus making it easier for any control failures to be located and corrected. The lamps in the upper control desk panel are arranged in horizontal rows and vertical groups. The top row of lamps indicates the condition of the control circuit at any place in the cycle or when the machine stops.

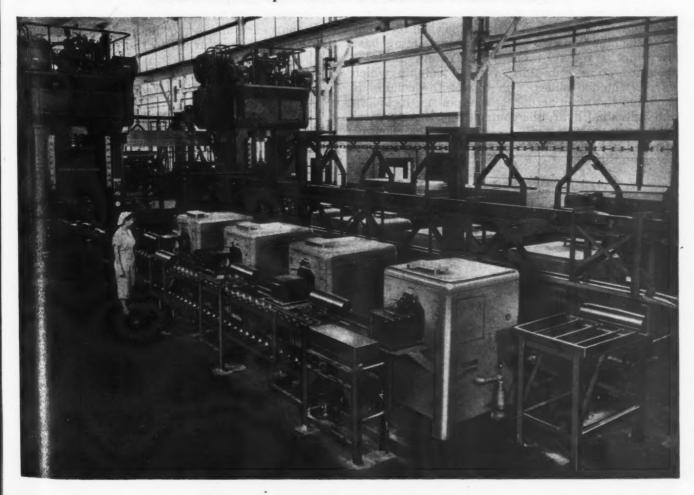
The remaining rows of lamps on the upper panel indicate the condition in which the control circuit should be at the end of the step being performed by the machine. The left-hand group of lamps in-

dicates the operating step that the machine is in when it stops. Thus, a comparison of the lamps in the upper row with the lamps in the row indicated by the step lamp that is lit in the left-hand group will show which section of the control circuit has failed to operate. This section can then be checked to determine the trouble. Similarly, the vertical groups of lamps are arranged to indicate steps in the operating cycle in each of the two machines being operated.

The lamps and push-buttons in the lower panel of the control desk are arranged in groups according to their relation to the control circuit. Every possible contingency in the operation of the machines is taken care of, enabling the operator to see at a glance how the steps in the operation of the machines are progressing, and to operate the various controls as required.

Separate push-button control boxes are provided for each machine and for the automatic loading machine for operation during a "jog" cycle. The jog cycle is used for testing and setting up the machines only.

Fig. 5. Battery of Tocco High-frequency Induction Heating Units Located in Their Proper Place in the Automatic Production Plant



THE AUTOMATIC MANUFACTURING PLANT

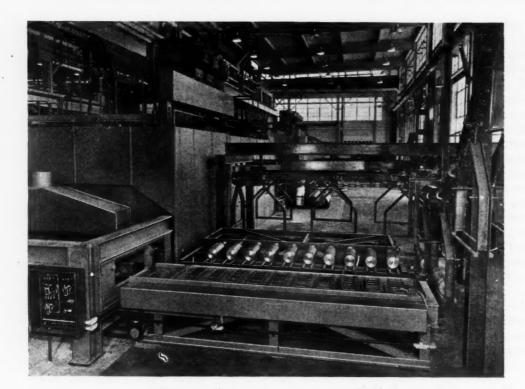


Fig. 6. Pallet Mechanism which Automatically Loads Shells into a Heat-treating Furnace

Fig. 4 shows a close-up view of the tooling of one of the two Barnes four-station center-column machines used for rough-turning the shell forgings. The machine consists of a main supporting base carrying a rotary table. This rotary table is mounted on a four-sided vertical column which carries the tool-slides. On top of the column is mounted the main actuating mechanism, including the individual hydraulic controls and the electrical panels for each station. In principle, the machine consists of eight lathes mounted vertically around a center column.

After two forgings have been positioned and clamped as described in connection with the description of the robot mechanism loading machine, Fig. 1, the center column indexes, bringing two more spindles to the loading position; and after these two spindles have been loaded, the machine again indexes until each of the eight spindles is loaded, two spindles being loaded at once. Then the tool-slide is indexed and starts its machining cycle. This tool-slide carries two banks of tools, one for each spindle assembly. The six tools are fed hydraulically into the shell to the proper depth, after which the entire slide feeds upward approximately 4 inches, completing the rough-turning operation. The seventh tool shown at the base and to the left of the chucked shell then takes a sweeping cut across the base of the shell, leaving only a small center for succeeding operations.

It will be noted that the machinery has been so designed that all tools are set in blocks which fit into predetermined positions on the machines, so

that, when the tools are dull, the tool-block itself is removed, sent to the tool-room, and the cutting tools sharpened and set to the predetermined position before it is returned to the production floor.

An Example of Automatic High-Frequency Induction Heating

Fig. 5 shows a battery of Tocco high-frequency induction heating units used to heat the nose of shells in preparation for the nosing operation. Obviously, this equipment with slight modifications could be applied to numerous other parts in mass-production industries.

After the rough-turned shell has been placed by the robot on the outgoing conveyor, it is conveyed to the Tocco induction nose-heating units. There are four of these units in each production line. The four units serve the one vertical hot-nosing press shown in the background. The rough-turned shells are kicked off at the machining stations, move down a conveyor onto a small slide which, in turn, loads them into the box-like fixtures in which are mounted the heating coils. The nose is then heated a predetermined amount, so that in the hot-nosing operation the following conditions will be met: The exact contour, both internal and external, will be maintained; the exact amount of metal required for the nosing operation will be available; the proper volume of the cavity will be maintained; and there will be sufficient metal for the final facing operation to give the correct finished length. When the proper degree of temperature is reached, kicker nosin
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b M the shell is retracted from the coils and again kicked onto the conveyor on which it travels to the nosing operation.

After complete inspection of inside and outside contours, volume, and length, the nosed shells are conveyed automatically to the pallet loading mechanism shown in Fig. 6. When ten shells have been assembled, as shown in this illustration, the pallet is automatically carried onto the transfer table which, in turn, automatically conveys it into the heat-treating furnace.

Group Consisting of Two Threading Machines and a Loading Machine

As previously mentioned, the groups of machines that perform machining operations consist of two machines with a robot mechanism loading machine between them. The heading illustration shows this arrangement. Here two threading machines are placed one on each side of the loading machine. The robot mechanism of the loading machine picks two shells from the incoming conveyor, automatically indexes to the threading machine, and loads the shells in the clamping fixtures attached to the machine. Collapsible taps then thread the nose and retract. Next the shells are unclamped automatically and removed by the robot mechanism, which then automatically indexes and places the threaded shells on the outgoing conveyor. This conveyor then transfers the threaded shells to the next work station for the performance of other operations.

Another Example of Automatic Machining

Fig. 7 shows a six-station machine used for turning and forming the rotating bands. Note that here, again, the shells are removed from the in-

coming conveyor by the robot mechanism and loaded into the machine. After being placed in position by the robot mechanism, the shells are pushed into collet type chucks, and having reached the proper point of location, are clamped. These chucks are so designed that every shell will be accurately located. There is no downward or upward movement of the shell throughout the clamping operation. The head of the turning machine is then indexed to each of five machining stations where the rotating band is successively rough-turned, rough-formed, and finish-formed.

The foregoing brief outline of a few of the operations performed in the Barnes automatic shell plant will doubtless prove sufficient to indicate that such automatic plants can be designed for the mass production of numerous parts and products for peacetime industries. Enormous quantities of parts can be produced by such an arrangement with a minimum of physical effort and labor.

As mentioned at the beginning of this article, it was not the purpose to present a complete description of the manufacture of shells, but rather to emphasize the possibilities of this type of manufacturing lay-out as applied to peacetime production. This plant, in its original conception and in its final detailed engineering, is believed to present a basic idea for the mass production plant of the future.

This development has not only an industrial significance, but a social significance as well, because as man contrives to produce the things that he wants for his comfort and well-being with the least amount of expense and effort, the higher will be the living standards that he can enjoy. The automatic plant of the future is simply another link in the chain that provides more goods for more people at less cost and effort.

Fig. 7. A Six-station
Machine for Turning
and Forming Rotating
Bands. The Shells are
Automatically Delivered
by Conveyor and Robot
Mechanism, and are then
Automatically Clamped
and Machined

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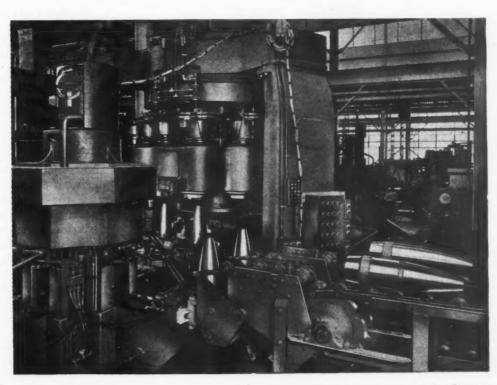
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Standard-Cycle Induction Heaters Speed Shrink-Fitting Operations

THE use of standard resistance welding machine components as simple 60-cycle induction heaters at a Detroit tank plant has lowered the floor-to-floor time in heating suspension arm bores for the shrink-fitting of serrated spindles from 35 minutes per piece, required in a heat-treating furnace, to 2 1/2 minutes per piece. At the same time, a costly cold-treating process for shrinking the spindles for final assembly in the bores has been eliminated.

The job consists of heating fifty-pound chromium-molybdenum steel suspension arms for shrink-fitting the spindles into the bores of the arms. To permit the spindle to be inserted, the 4 1/2-inch diameter of the bore must be increased approximately 0.012 inch. This requires that the suspension arm be heated up to a limit of 500 degrees F. If this temperature is exceeded, the metallurgical characteristics of the metal will be altered.

While the use of induction heating at power-line frequencies of 60 cycles per second is not new, the present interest in the comparatively complex and

A 60-cycle Induction Heater Made from Standard Sub-assemblies of a Progressive Resistance Welder

costly high-frequency induction heating (10,000 to 500,000 cycles per second) has overshadowed the possibilities of 60-cycle induction heating for operations where high surface heating rates with minimum penetration of heat into the work-piece are not required.

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The machine shown, designed to heat the bores of two suspension arms simultaneously, is a combination of a standard Progressive 100-KVA welding transformer, a simple air cylinder, and standard resistance welder control units. A copper current-carrying loop to enclose the work-pieces was arranged so that one section of it could be raised and lowered by the air cylinder to permit the insertion and removal of the suspension arms. This loop, when closed and with current flowing through it, sets up an intense alternating magnetic field within that portion of the work-piece adjacent to the loop, thus generating the heat within the part necessary to produce the required temperature and expansion. The transformer and conductors are water-cooled, as in standard resistance welding machine practice. The machines operate from standard 230-volt, 60-cycle, single-phase alternating current.

The pressing of a palm switch sets in motion a simple automatic heat-operated timer, which turns on the heating current for a preset time and heats the part to the limit of 500 degrees F.

A Model One-Man Machine Shop

A model machine shop suitable for one-man operation, which can be installed in the back of a store, in a two-car garage, or even in a basement, has been placed on exhibition by the DoAll Co. at the company's Des Plaines, Ill., plant, 264 N. Laurel Ave. The shop on exhibition is one of eight types of service and repair shops prepared by the industrial planning engineers of the company to assist veterans with mechanical skill who desire to go into business for themselves. Although the various types of shops are designed primarily for repair and service work, the shops can be adapted to small specialty parts manufacture, and may thus form the nucleus of larger manufacturing facilities.

A training program is offered at the DoAll Technical Institute through which information is furnished relating to costs and methods of financing and other problems to be met in conducting a business. A 64-page book "Make Money With Your Own Shop," describing the entire program, can be obtained by veterans interested in owning and operating their own businesses by addressing the DoAll Co., Minneapolis 4, Minn.

Five Hundred Dollars in Prizes for Articles on Ingenious Mechanisms

MACHINERY offers \$500 in cash prizes for the eight best articles on ingenious mechanisms to be submitted to the Editor before May 1 of this year. Each article should be confined to a description of one mechanism or one mechanical movement. The money will be distributed as follows:

One prize			٠							\$200
One prize										
Two prizes.										
Four prizes										

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In addition to these cash prizes, MACHINERY'S high-level space rates will be paid both for prize-winning articles and for all other articles accepted for publication that may not receive a prize.

Each contestant may send as many articles as he wishes. All will be entered in the competition and all may be accepted for publication; but no contestant will be awarded more than one prize.

Articles entered in this competition should be addressed to the Editor of MACHINERY, 148 Lafayette St., New York 13, N. Y. Remember that they must be mailed on or before May 1.

Preparing Articles for the Competition

This competition applies to any kind of mechanism making use of a practical and ingenious mechanical motion or principle. The competition is open to all, whether subscribers to Machinery or not. The general procedure is very simple.

1. Send a drawing of the mechanism (or photograph if preferred—or both) that clearly shows all important parts of the particular movement to be described.

2. Describe as clearly as possible both the pur-

pose of the mechanism and its action—how it does what it does.

3. Mark the important parts on the drawing, such as levers, cams, etc., with letters, *A*, *B*, etc., and use corresponding letters to identify those parts in the description; thus, "Lever *A* is operated by cam *B*." This will help to make the description readily understood.

4. Confine each article to a single mechanism or movement; do not describe an entire machine or refer to parts that do not affect the movement being described.

Suggestions about Illustrations and Manuscripts

Clear blueprints or pencil drawings with distinct lines are satisfactory for illustrations. They should be made on separate sheets of paper. Send only drawings that are to scale, with the various parts shown in correct relationship and proportion. Rough free-hand sketches cannot be used. The drawing must show the assembled mechanism, although a diagram or a drawing that is partly diagrammatic may often be substituted to advantage, especially if it more clearly illustrates the arrangement of a complicated mechanism.

It is more essential that important facts be clearly stated than that the manuscript be neatly written; but carefully prepared manuscripts usu-

ally indicate careful thought.

Avoid describing a mechanism that is familiar to most designers; descriptions of movements that are generally known cannot be accepted, even though they may be very ingenious. It is immaterial how long ago a mechanism or movement was designed, provided it has not previously been described in any publication or text-book.

Important Suggestions

Be sure to describe as clearly as possible both the purpose of the mechanism and its action—what it does and how it does it. Describe the purpose first, and the means of accomplishing it afterward.

Confine each article to a description of a single mechanism or mechanical movement. Do not describe the entire machine of which the mechanism or movement is a part. Clear descriptions of separate mechanisms rather than de-

scriptions of entire machines are desired. Omit reference to parts of the machine that do not affect the movement being described.

Do not describe mechanisms that are familiar to most designers. On the other hand, it is immaterial how long ago a mechanism or movement was designed; but it must not have previously been described in any publication or text-book.

Bright-Hardening of Tools and

Types of Atmospheres Suitable for Bright-Hardening and Equipment for Producing These Atmospheres— First of Two Articles

MPORTANT developments in the application of separately produced controlled atmospheres for use in the heating of metals for hardening allow close control of the surface conditions and eliminate soft skin and scale on the piece being hardened. Elimination of soft skin means that the carbon content of the steel is maintained at the surface, as well as throughout the piece, during heating and subsequent quenching. Elimination of scale means that the piece can be heated and quenched without oxidation of the surface.

The designer of machine parts and tools and the metallurgist can utilize these developments as

follows:

1. Usually, it is unnecessary to allow for finish-machining or grinding operations after heat-treatment, since the surface is "full hard" and no "soft skin" due to loss of carbon from the steel (decarburization) is present.

2. Heat-treatment is possible in "final form" of machine parts, tools, or dies of complicated shape or contours, where many surfaces are practically inaccessible for the performance of final machining or grinding operations.

3. Operations for cleaning, sand-blasting, or descaling become unnecessary.

Utilization of these factors in machine and tool

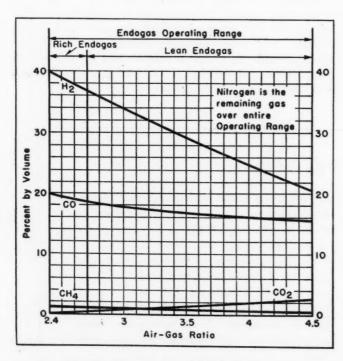
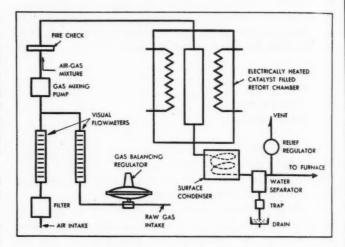


Fig. 1. Composition of Bright-hardening Atmospheres Produced from Fuel Gas



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Fig. 2. Flow Diagram of "Endogas" Generating Unit

design may result in considerable cost reduction, and at the same time, allow closer control of the quality and uniformity of the product.

In this article the following principal topics will be dealt with: (1) Types of atmospheres suitable for bright-hardening, and their composition and cost. (2) Equipment for producing these atmospheres, and methods and equipment for evaluating the metallurgical effect of the atmosphere on the material being heat-treated. In a subsequent article, to be published in March Machinery, the principal types of industrial furnaces suitable for use with bright-hardening atmospheres, and the methods of applying this equipment to the bright-hardening of a variety of machine parts, will be discussed.

Types of Atmospheres Suitable for Bright-Hardening

The experience gained during the last few years in the development of atmospheres suitable for bright-hardening has shown conclusively that the atmosphere required, if decarburization is to be prevented, must be very low in CO₂ (carbon dioxide) and H₂O (water or moisture), no matter how the atmosphere is produced and no matter what source of fuel is used. Now, CO₂ and H₂O can be reduced to very low values in a gaseous mixture by: (1) Using auxiliary equipment for removing carbon dioxide and moisture. (2) Reducing the amount through the reaction of CO₂ and H₂O with metallic vapors which have a high affinity for such oxidizing components in gaseous mixtures. (3) Converting the CO₂ and H₂O to CO

Machine Parts in Controlled Atmospheres

By C. E. PECK, Manager Industrial Heating Engineering Section Westinghouse Electric Corporation East Pittsburgh, Pa.

and H_2 by reaction with hot charcoal. (4) Causing complete reaction of the proper air-gas mixtures by controlled heating in the presence of a catalyst, so that the residual CO_2 and H_2O are very small.

This article deals principally with the successful commercial application of Method 4. Some of the particular advantages of this method are:

1. The controlled atmosphere is economically and continuously produced directly from a fuel-gas-air mixture, eliminating the necessity for auxiliary equipment for either removing or causing further reaction or conversion of CO₂ and H₂O, so that they do not exist in the product gas.

2. The method can be used directly in standard furnace equipment designed for heat-treatment with a separately produced atmosphere, since special muffles are not required.

3. Approximate chemical balance of the atmosphere with steel surfaces of a wide range of carbon contents, heat-treated over a wide range of temperatures, can be obtained by simple adjustments, so that decarburization and oxidation do not occur.

As an example of a protective atmosphere produced by complete reaction, the chart shown in Fig. 1 gives, in the region of the extreme left-hand side, a picture of the composition of rich Endogas. The reactions which take place to produce this gas, assuming methane as the fuel gas, are as follows:

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$$CH_4 + 1/2 O_2 + 1.88N_2 \longrightarrow$$
 $CO + 2H_2 + 1.88N_2$

The end product contains small amounts of carbon dioxide (CO₂) and water vapor, consistent with the laws of mass action and equilibrium fundamentally related to the production of any gas. Since this gas is produced at high temperatures, and is, to all practical purposes, in equilibrium, there is very little change in composition of the gas when used in furnace equipment unless considerable impurities are allowed to enter the furnace during the handling of the work.

A schematic flow diagram of the equipment used to produce the completely reacted gas (which is termed Endogas because heat is required to complete these reactions) is shown in Fig. 2. A gas mixing pump draws air

through a filter, and the air flow automatically regulates the flow of gas to give a predetermined air-gas ratio. The air and gas, after flowing through the pump visual flow-meters, which indicate the air-gas ratio, are mixed together. The pump moves the air-gas mixture through a piping system and fire-check to an electrically heated catalyst-filled chamber; in this chamber the reaction of the air-gas mixture takes place to produce gas of the composition shown to the left in Fig. 1.

With methane as the fuel, this gas consists of approximately 40 per cent H₂, 20 per cent CO, 0.50 per cent methane (CH₄), and 0 per cent CO₂, with the balance nitrogen. The dew point is —10 to —15 degrees F. The gas leaving the catalyst-filled chamber is quickly quenched in a surface condenser, and a water separator is also provided for those applications where it is desired to operate the equipment at a leaner mixture of air-gas which will produce some water vapor. A photograph of this equipment is shown in Fig. 3. The average cost of this gas, using commercially available fuel

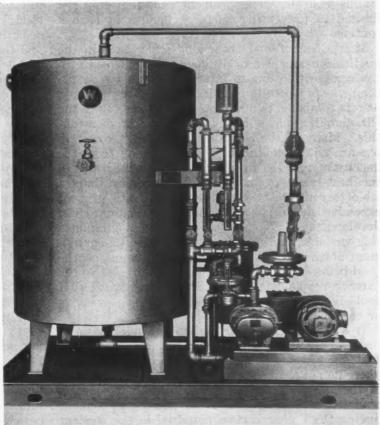


Fig. 3. Endogas Atmosphere Generating Unit

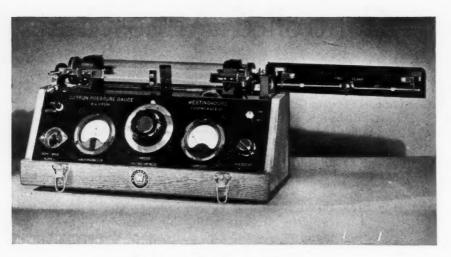


Fig. 4. Carbon Potential Indicator

gas as a source, varies from 18 to 25 cents per 1000 cubic feet of produced gas.

The "ideal" solution to the problem of hardening a piece of high-carbon or alloy-carbon steel without decarburization, carburization, or oxidation is to surround the piece at its hardening temperature with an atmosphere that is in chemical equilibrium with the carbon content of the steel and that will not oxidize the surface. In general, long experience has shown that an atmosphere which is close to being in equilibrium with the steel at hardening temperatures is always non-oxidizing, so that the problem of oxidation can be eliminated entirely, except on the high-chromium stainless steels. The problem can, therefore, be limited to preventing surface changes in carbon content.

It has been found from long experience in the application and use of Endogas that the shift in gas composition due to inter-reaction between the components is negligible, since the gas as produced has its components inherently in balance. Both the CO2 and H2O must be small in amount to attain this. Many of the controlled atmospheres now in use are not in equilibrium as they come from the generator, and the resultant inter-gas reactions in the heat-treating furnace make it almost impossible to control the constituents so as to prevent excessive decarburization or carburization. The development of a completely reacted gas eliminates this variable, and narrows the problem of equilibrium down to the actual effects of the gas on the steel being heat-treated. This discovery led to the further development of an indicating device that could be used as a measure of the carbon pressure or carbon potential.

If a change in carbon content of steel is to be prevented during heat-treatment, it is necessary that the carbon potential of the furnace atmosphere be maintained at a value about equal to that of the steel. If these potentials are not equal, a transfer of carbon will occur from the element having the higher carbon potential to the element having the lower one. The passing of carbon from the steel to the gas is what we call decarburization.

The rate of carbon transfer between the steel and the atmosphere surrounding it is a function of the difference between these carbon potentials; the temperature; and the rate at which carbon will enter or leave the surface of the steel at the existing temperature.

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The Carbon Potential Indicator

The carbon potential indicator, shown in Fig. 4, is used to measure the carbon potential or carburizing properties of a protective atmosphere. It is also useful as an aid in setting the air-gas ratios of the Endogas

generators to obtain an atmosphere that will be in carbon balance with the steel being heat-treated in this atmosphere. Most indicating devices for atmosphere measure properties related to the amount of combustibles in the gas, or the thermal conductivity of the gas; none of these bear any definite relationship to carbon potential. The instrument illustrated specifically measures carbon potential, independently of the other properties of the gas.

The carbon potential of a gaseous atmosphere is determined with the carbon potential indicator by heating a fine steel wire in the gas until a carbon equilibrium has been attained between the hot wire and the gas. The wire is then suddenly cooled to retain its carbon in a martensitic structure. The electrical resistance of the wire in this state is a sensitive function of the carbon content of the wire, and the carbon content attained depends upon the carbon potential or carburizing power of the gas. Consequently, under standardized conditions of procedure, the resistance of the wire serves as a measure of relative carbon potential of the gas under test.

A schematic diagram of the carbon potential indicator is shown in Fig. 5. After the glass tube enclosing the test wire has been well purged with gas, heating current from an internal adjustable supply voltage is applied to raise the wire to the test temperature. A glow tube operating from a constant-voltage regulator has an apparent temperature of 1700 degrees F. for use as a comparison standard. It maintains the test wire at that temperature, regardless of variations in ambient temperature, gas-flow rate, or the heat conductivity of the gas being tested. To insure that equilibrium conditions are approached, a period of heating of 15 to 30 minutes may be necessary, particularly for accurate comparison of low-carbon potential.

Turning off the heating current at the end of the test period allows the wire to "gas quench," so that it will retain its carbon in a martensitic structure. Test wires containing less than about 0.45 per cent carbon show a momentary arrest in their contraction on cooling when they go through the temperature range in which their hardening trans-

formation occurs, but they reach the "taut" wire position at room temperature. Wires with higher carbon content have a permanent sag at room temperature. This sag may be measured by a mirror and scale mounted at the center of the tube.

To measure the electrical resistance of the test wire, it is drawn from the tube to a position between the bridge circuit contacts on the panel that swings out from the right-hand end of the instrument. When the bridge circuit is balanced, a measure of the wire's resistance is given by the reading on the center dial of the panel. This, in turn, gives an indication of carbon potential by reference to a calibration curve. In general, the equilibrium carbon value reached in a furnace is higher than that attained by a test wire surrounded by the same atmosphere cold. However, this instrument serves to gage the magnitude and direction of any change in the carburizing power of a furnace atmosphere.

With this type of instrument, it is possible to evaluate the carbon potential of the gas atmosphere at various heat-treating temperatures, and to correlate these values of carbon potential with the equilibrium carbon content of the steel over a wide range of carbon content.

In order to do this, the carbon potential, as measured on the gage with a given gas composition, is compared with the carbon content of the steel (at a given temperature) over which is passed the same gas for a sufficiently long period to reach equilibrium. In other words, if the steel contains more carbon, and therefore a higher carbon potential, then the gas surrounding the steel, it will be decarburized until the carbon potential of the steel is equal to the carbon potential of the gas. If the carbon content of the steel is carefully measured both before and after such a test, it is possible to accurately evaluate the actual carbon potential of

the steel and to correlate this value with the resistance of the hot wire, as measured in the hot wire gage in the same atmosphere.

Result of Changes in Temperature and Carbon Content

A summary of the results of such an investigation at various temperatures is shown by the curves in Fig. 6. These curves are of considerable interest, since it is possible to obtain from them a relative idea of the carburizing or decarburizing power of the atmosphere at various temperatures and the function of the carbon content in the steel. For instance, from the curve at 1900 degrees F., we note that a gas atmosphere surrounding the steel which would give a resistance of 1.7 ohms on the hot wire gage, will be in equilibrium with a steel of approximately 0.3 per cent carbon. At the same resistance, with the same gas surrounding the steel at 1500 degrees F., this gas would be in equilibrium with a piece of steel containing 1.1 per cent carbon.

The reason for this is that the carbon potential of the gas remains constant, due to the continuous flow of new gas into the furnace, while the carbon potential of the steel depends almost entirely on the temperature surrounding the steel and the composition of the steel. Therefore, the rate of escape of carbon would be much more rapid at 1900 degrees F. than at 1500 degrees F. for any steel of a definite carbon content. These curves also show that the carbon potential of a low-carbon steel at a high temperature is equal to the carbon potential of a steel of higher carbon content at a lower temperature.

The data shown by the curves are based on an investigation using plain carbon steels. The actual rates of decarburization or carburization and the

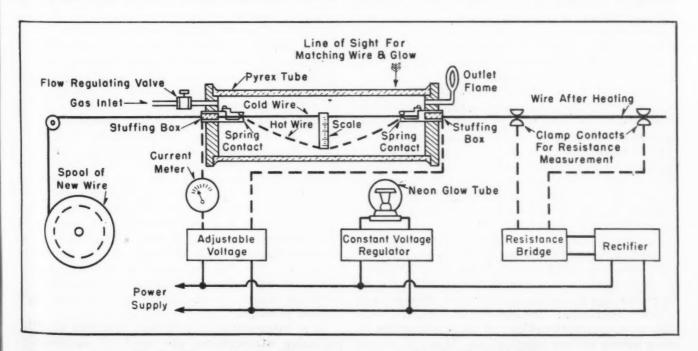


Fig. 5. Diagram Showing Details of Arrangement of Carbon Potential Indicator

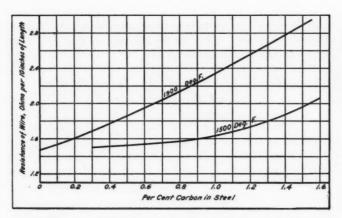


Fig. 6. Curves Showing the Variation in Carbon Potential with Temperature

equilibrium carbon contents of the various alloy steels are not necessarily quite the same as those for straight carbon steels. However, the carbon potentials shown by the curves are still a valuable guide for determining the relationship between the probable carbon pressure required in the atmosphere for a given carbon content in the steel, as related to the hot wire gage reading. Since the rates of carbon loss from the surface are relatively much slower at the lower temperatures, it is possible to use a gas with a wider latitude of carbon potential for plain carbon steels than it would be for steels requiring much higher heat-treating temperatures.

Types of Steels for Bright-Hardening

Experience with numerous installations covering heat-treatments involving a wide range of temperature, and also covering a wide range of alloy and high-carbon steels, has proved that a completely reacted fuel gas is very suitable for bright-hardening without oxidation or decarburization. Because the gas is easily adjusted to give various carbon potentials, as described in the previous paragraphs, it is capable of bright-hardening over a wide range of temperatures without excessive carburization or decarburization.

In general, for the large group of steels of the alloy type which are hardened in the neighborhood of from 1450 to 1550 degrees F., the carbon potentials of the gas do not need to be nearly so high as for the more special steels requiring much higher hardening temperatures. In these lower temperature ranges, it is also practical to heat-treat with a wider range of carbon potential and still not experience any particular tendencies toward marked decarburization or carburization.

Further, in this lower temperature range the amount of furnace impurities can be greater without preventing good results from being attained. In those cases where furnace impurities, due to door openings and other factors that allow oxygen to enter the furnace, are reasonably high, it is possible to overcome the effects of these impurities by using higher carbon potential gas. This has proved to be practical in many applications.

Considerable experience in various applications has shown that for short-cycle heat-treating in a completely reacted gas, like Endogas, the activity of the gas is low enough to allow a considerable margin of variation of carbon potential without harmful results to the steel. An interesting example illustrates this point.

Certain areas of an SAE 1020 steel part were carburized and the part was then heated for hardening in a completely reacted gas atmosphere having a carbon potential balanced with a medium carbon steel. After heating for one hour at 1550 degrees F., and quenching the piece in water, it was found that the carburized areas were file-hard and the uncarburized areas were soft enough to machine.

For short heating periods, a medium carbon potential will accommodate steels which have a considerable carbon range, and the effects of decarburization or carburization will be very small. This is an important practical consideration, since many heat-treating problems are of this type, and a large number of applications fall in the range of medium carbon contents hardened at temperatures in the neighborhood of from 1450 to 1550 degrees F.

Hardening High-Speed Steels

In the heat-treatment of high-speed steels at high hardening temperatures, such as from 2250 to 2350 degrees F., the carbon potentials required are much higher, and in this case the equipment is operated to produce a gas having a very high carbon potential. In some cases, this requires a higher methane content in the gas, in order to give the high carbon potential necessary. This is particularly important on tungsten high-speed steels, where the use of a high reducing atmosphere keeps the surface very clean during heating, but where any decarburizing action is accelerated greatly by reason of the fact that there is no oxide film to protect the loss of carbon from the surface.

Tungsten high-speed steels are not so sensitive to decarburization during heating when the atmosphere is slightly oxidizing. Many so-called reducing atmospheres are in reality slightly oxidizing to tungsten high-speed steels at the high hardening temperatures used, since at these temperatures it does not require very much carbon dioxide to make the atmosphere slightly oxidizing. For this reason, the tungsten high-speed steels have been successfully heat-treated with very little decarburization. In so-called "reducing atmospheres" containing appreciable amounts of carbon dioxide, the slight oxidation has prevented the high rate of decarburization which would have taken place if the atmosphere were truly reducing at the high temperature. For this reason, it is very important, when using a highly reducing gas, to have sufficient methane present in the gas to give a very high carbon pressure.

It is interesting to note that, whereas slightly oxidizing atmospheres are used to successfully harden high-speed tungsten type tool steels with-

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out decarburization, the same type of atmosphere is extremely decarburizing to the molybdenum type of high-speed steel. On the molybdenum type of steels, the high reducing atmospheres are more successful, and actually the extremely high carbon potentials required for tungsten are not as necessary for the molybdenum steels. In any case, however, when high-speed steels are hardened at the high temperature ranges, the rates of decarburization or carburization are very rapid, and it is important that the atmosphere surrounding the steel be virtually in chemical balance with the steel; otherwise, very active decarburization or carburization will take place in relatively short periods of time.

The class of steels that harden in air, as compared to those hardened in a liquid quench, and that contain large amounts of chromium, are subject to some oxidation when hardened in a completely reacted fuel-gas atmosphere. In many practical applications, the amount of oxidation is not serious and the atmosphere is suitable; but if the requirement is for truly bright-hardening, with very small or no oxidation, then the only atmosphere that can successfully be used is dissociated ammonia, containing 75 per cent hydrogen and 25 per cent nitrogen.

The present article has covered atmospheres for bright-hardening and methods and equipment for evaluating the metallurgical effect on various types of steels. In an article to be published in March Machinery, the principal types of controlled-atmosphere furnaces used for the heating of a wide variety of machine parts and tools will be dealt with, and an outline of their applications given.

A Heavy Job for Carbide-Tipped Tools

The accompanying illustration shows what may well be the largest carbide-tipped tools ever used on boring mills. These tools were employed for boring cast armor on Army tank parts. In the illustration a Firthite-tipped tool is shown taking a 2 3/4-inch wide cut at a 9-degree angle on the inner face of a tank guard ring. Despite the heavy interrupted cut, a speed of 7 1/2 revolutions per minute—several times that permissible with other tools—was attained with a feed of 0.011 inch per revolution. The carbide tip is the darker portion inserted in the shank shown in the illustration.

Army ordnance officers had originally planned to use 650 boring mills to meet tank production requirements. However, the use of carbide tools so speeded up the turning, facing, and boring operations that only about 400 boring mills were needed. These boring mills were designed by the Consolidated Machine Tool Corporation, Rochester, N. Y., but were built by six different manufacturers in 78-, 100-, and 112-inch sizes.

Westinghouse Electric Corporation has announced that 789 veterans of the recent war, including 321 former employes, had been hired or returned to employment in the steam and aviation gas turbine divisions in Philadelphia, Pa., up to October 31. Of the twenty-four women employes who enlisted in the four women's branches of the armed services none has returned to her job.

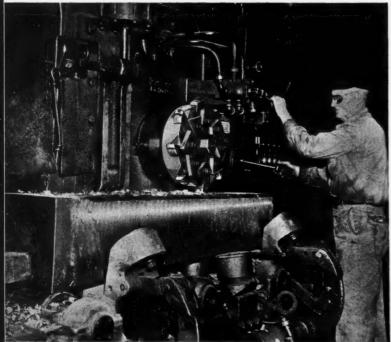
Cutting Tool Manufacturers Association Elects Officers

E. A. Goddard, general manager of Goddard & Goddard Co., Detroit, Mich., was elected president of the Cutting Tool Manufacturers Association at the organization's second annual meeting held in Detroit recently, and R. G. Michell, president of the Eclipse Counterbore Co., of Detroit, was elected vice-president of the Association. R. H. Wolfe, president of the Arrow Tool & Reamer Co., Detroit, was reelected treasurer of the Association, while Harry J. Merrick continues as executive secretary. Elected as new directors to serve for three years were L. C. Gorham, president of the Gorham Tool Co.; E. C. Putnam, president of the Putnam Tool Co.; E. F. Reinhart, president of the Republic Drill & Tool Co.; and R. H. Wolfe.



Taking a 2 3/4-inch Wide Cut on Armor Plate for Tanks with a Carbide-tipped Tool

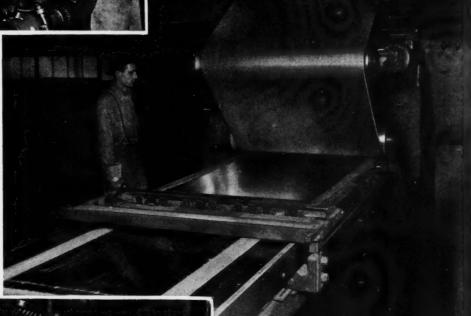
Outstanding Operations in



A Variety of Ingenious Manufacturing Methods Developed at the Huntington, West Virginia, Plant

(Left) "Billeteer" Used to Mill away Surface Defects on Ingots of Monel, Nickel, and Inconel as They Come from the Casting Molds. Eight Heavy Tool Bits on the Revolving Cutter-head Mill All Four Sides of Ingots between Indexings

(Right) High Finishes are Imparted to Monel, Nickel, Inconel, and Other Nickel-alloy Sheets by Polishing Machines of the Type Here Illustrated. A Wide Fastrunning Emery Belt Polishes the Sheets as They are Reciprocated Rapidly by the Table beneath the Belt



(Left) Cold-rolled Nickel-alloy Sheets Coming from a Cluster Mill, Consisting of Two Upper and Two Lower Workrolls Backed up by Single Largediameter Rolls. One Pass through a Cluster Mill is Equal to Eighty-four Passes through the Usual Mill

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Inco's Huntington Mill

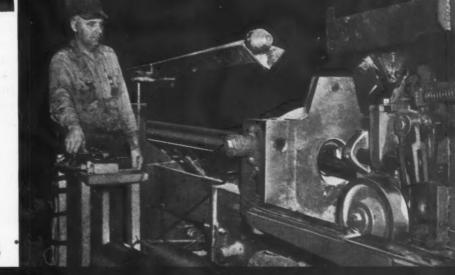
of the International Nickel Company for the Processing of Nickel and Nickel-Alloy Products

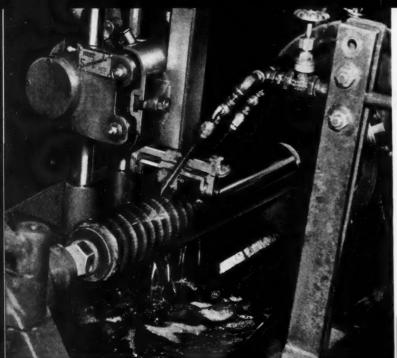
(Right) The Ends of Nickel-alloy Tubes that are to be Cold-drawn to Smaller Diameters are Swaged in Machines of the Type Here Illustrated to Enable the Tubes to be Fed into the Dies of the Draw-benches, as Shown below



(Left) View of a 100ton Draw-bench which Shows the Pointed or Swaged End of the Tube Extended through the Die, Ready for the Jaw Gripper on the Pull-head

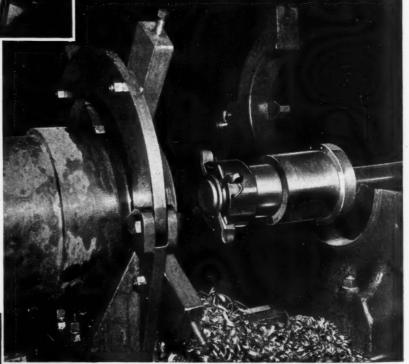
(Right) Another View of the 100-ton Draw-bench Illustrated Above, Showing the Pull-head Moving Forward toward the Die, Ready for Gripping the Swaged Tube End. In the Drawing Operation, the Pull-head, of Course, Moves toward the Right





(Left) Super-finishing a Plunger which Must have a Surface Finish of Five Microns or Better over Its Entire Length. The Machine Employs a Very Fine Abrasive Stone and Reciprocates the Stone in a Longitudinal Direction in Relation to the Plunger while the Latter is Slowly Rotated and Fed along the Stone

(Right) Employing a Rough Counterboring Tool in an Operation on an 8-inch Cylinder. The Cutter Bits can be Collapsed to Enable the Cutterhead to be Fed through a Small Neck and then Opened up for Machining to a Diameter Considerably Larger than the Neck



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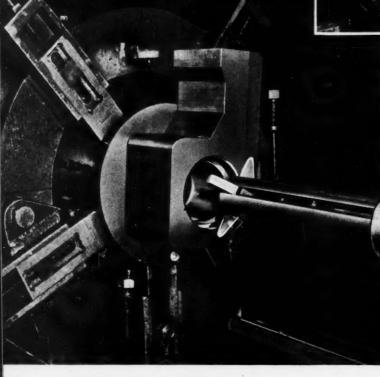
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(Left) Another Type of Counterboring Tool which is Employed in a Finishing Operation on an Air Cylinder 5 Inches in Diameter and 38 Inches Long. The Illustration Shows the Tools Expanded to the Diameter at which They are Used after They have Passed through the Small-diameter Throat of the Work

166-MACHINERY, February, 1946

What the Designer Should Know About Welded Machinery Parts

A Few Basic Considerations to Aid the Engineer in Planning Designs of Machines and Structures Suitable for Construction by Welding. Abstract of a Paper Read Before the Recent Annual Meeting of the A. S. M. E. - Second of Two Articles

> By GEORGE L. SNYDER, Chief Engineer, Lukenweld, Inc. Division of Lukens Steel Co., Coatesville, Pa.

AVING considered the production and application of components in the first installment of this article, published in January MACHINERY, the subject of fabrication in developing a weldment from the designer's viewpoint is bility of breaking up the weldment into sub-assem-

the next consideration. The first aspect covers the type and extent of available equipment in the welding shop which will produce the pieces designed. This is important, since the more flexible and extensive the equipment, the more freedom there is in design. In addition. when quantities are involved. it may be advantageous to design to suit the facilities of a welding shop. Usually, it is well to consult with the engineering staff of the shop most likely to be selected as the supplier, particularly if repetitive items are contemplated.

Production methods involved in the fabrication of weldments may be considered from two aspects. 'The first concerns the extent of what might be termed "universal" equipment, such as positioning facilities, automatic welding units, inspection methods, and stress-relieving facilities. Many types and sizes of positioning equipment are in use in welding shops today. The second aspect has to do with special jigs or fixtures or other types of tooling that might be justified or imperative. Usually, if the product is to any degree repetitive in

quantity, the possibilities of special holding devices should be considered.

Also to be considered by the designer in order to promote economy and obtain quality is the possi-



Fig. 13. Two Specially Designed Fixtures for Welding in Quantity Production

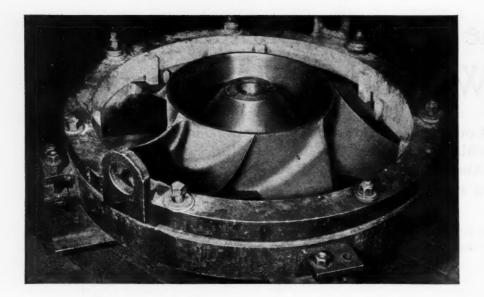


Fig. 14. High-speed Fan and Jig Especially Designed for Use in Welding It

blies in sizes to suit the production equipment. If the final size of the part, as designed, exceeds the limits of available equipment, possibly it can be redesigned.

With special tooling, the designer should keep in

mind that he is dealing still with rough component parts, despite measures that might have been taken to minimize tolerances. Weld-shop tooling naturally is more restricted than that usually available in machine shops. Tools such as jigs should be designed with flexibility in mind. Fig. 13 shows two special fixtures which are typical.

Special tooling also might be mandatory in order to hold components in the proper relation to each other during the welding operation. Fig. 14 shows a fixture designed for

welding a high-speed fan, with the weldment in place. Although sub-assemblies frequently are important to the designer of weldments, design limitations often prohibit their use. Obviously, the more work done on small pieces, the easier and quicker will be the completion of the final assembly.

A completely welded sub-assembly is illustrated in Fig. 15. The final weldment is shown in Fig. 16. Here, design controls the method of fabrication, for the lower flange member could be made in one piece. In that case, at least a portion of the sub-

assembly welding would have been required on the larger and more cumbersome piece. bly, con X-r

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Sub-assemblies of components should be made so that particular portions in certain instances can be sized before they become part of the final weldment. This practice helps insure that the final weldment is close to the required dimensions. Where tolerances are cumulative, straightening or trimming might be involved. Sometimes in very complicated structures involving considerable welding, various sub-assemblies are stress-relieved

before being assembled into the complete structure, to reduce the accumulation of residual stresses.

Sub-assemblies also facilitate inspection of welds. At times, where X-ray inspection is specified, sub-assembly welding is necessary, for if the welding were not completed and X-rayed in the sub-assem-



Fig. 15. Sub-assembled Component of a Weldment. Welding is Completed before Further Assembly is Done

Fig. 16. Lower Section of Welded Gear Reduction Housing, a Sub-assembly of which is Shown in Fig. 15

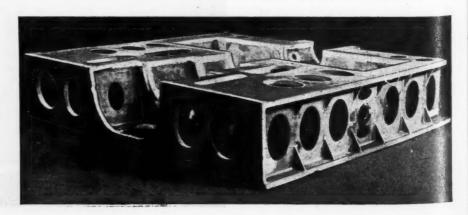




Fig. 17. Welded Sub-assembly Designed with a View to Making All Welding Locations Readily Accessible to the Operator

bly, the interference of adjacent components in the completed assembly might make it impossible to X-ray or repair such welds.

At times, when sub-assemblies include compartments subjected to pressure or oil retention tests,

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An important reason to give careful consideration to sub-assembly design is the necessity for providing accessibility for the greatest possible amount of welding, as the more accessible the welding, the less it will cost. Also, quality is more

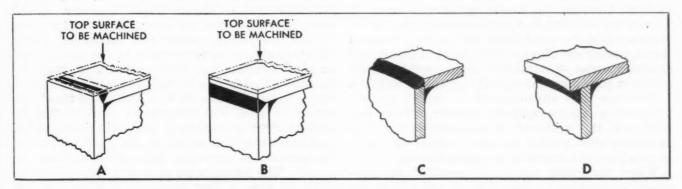
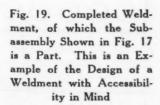


Fig. 18. Types of Welded Joints to be Considered by the Designer

they are welded completely. Tests are made and necessary repairs completed on the sub-assembly piece. This practice is more economical than to do such work on the final piece, if only from the standpoint of the relative bulk to be handled.

readily achieved if the welding operator can work under accessible conditions. Fig. 17 shows a subassembly on which all parts of the unit to be welded are easily accessible to the operator.

Fig. 19 shows the completed weldment with the



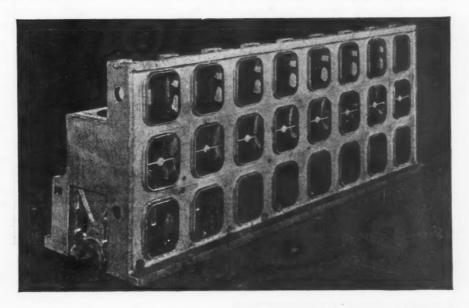




Fig. 20. Stiffener Arrangement on Under Side of Machine Bed. By the Use of a Flame-cut Piece at the Center of the Intersection of the Diagonal Members to Obtain Square Joints, Fitting and Welding are Simplified

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sub-assembly in place. Obviously, welding has been simplified, since the joining welds between sub-assemblies and main assemblies are completed by working through the access openings shown. If most of the welding had not been completed in the sub-assembly, it would have had to be performed through such openings. This would have necessitated the use of a mirror by the welder, with resulting slow and consequently expensive welding.

At times it is advantageous to design so that progressive sub-assembly is possible. Thus, one portion of the weldment is completed before it is assembled and welded to other components as a step in the final assembly of the weldment.

When maximum access is provided by subassembly practice or other design control, inspection can be more conclusive. Fig. 16 illustrates a design that provides accessibility by ellipticalshaped openings, permitting access to the inner side of the joints to be welded. Here, the desirable structural qualities of a box member are not sacrificed for accessibility.

In addition to the type of welded joints used, their position in the weldment deserves careful design consideration for several important reasons besides positioning them for maximum access. When machined surfaces occur in the design, care in placing joints can effect economy, as the comparative illustrations in Fig. 18 show. Clearly, if the joint is placed as at A, a portion of the deposited weld metal will be removed in machining operations. The depositing of weld metal is expensive, and removing it is wasteful. At B is shown how the amount of necessary weld metal has been reduced. The joint shown need only have the crosssectional area of that shown at A after it is machined. Economy may be possible by positioning a joint as shown at C, which eliminates the kerf and its cost, or at D, which also simplifies fitting, in contrast to the same joint at A.

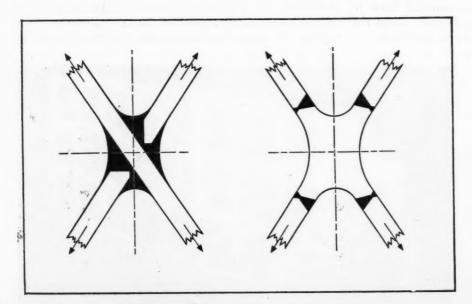


Fig. 21. Types of Intersections without and with Transition Piece

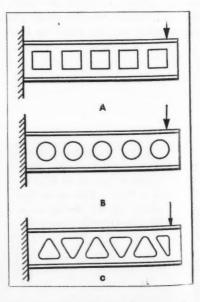
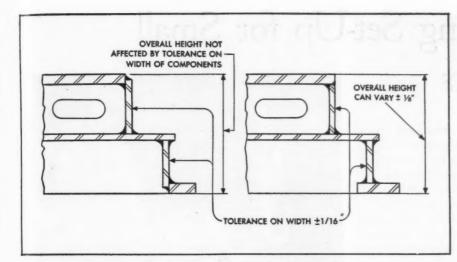
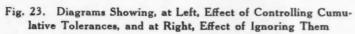


Fig. 22. Cantilever Beams with Three Designs of Web Openings





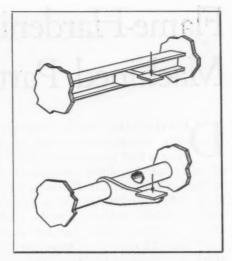


Fig. 24. Example of Two Methods of Resisting Torsional Force

At times, spoked or diagonal members are used because of design considerations, and their intersection usually presents a type of joint difficult to fit and costly to weld, if proper external contours are to be maintained. An example is shown in Fig. 20. Here the diagonal pattern of the box stiffeners on the under side of a machinery bed is highly desirable from the standpoint of maximum rigidity. However, their central intersection presents a problem of the nature just described. By the utilization of a flame-cut central member, square joints at the intersection have been obtained; hence, fitting and welding are simplified.

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At intersections of members subject to high stress, fatigue, impact, or a combination of these factors, careful design treatment is imperative. Contrasting designs of such an intersection are shown in Fig. 21, where the illustration at the left shows the intersection as welded without benefit of a transition member. Clearly, in order to provide curved contours, an inordinate amount of weld metal would be necessary. In addition, it is practically impossible to execute such a welded joint so that full strength will result. Fitting conditions are poor, and the excessive amount of weld metal adds to warpage and shrinkage problems. The desirable features of a similar joint executed as shown at the right in the illustration are selfevident. As a rule, however, the fewer separate and different components required in a weldment, the cheaper and better the design will be.

At times, particularly with secondary members such as ribs or stiffeners, slight changes will permit uniformity in size of different components. Such consideration might make quantity production by blanking economically possible. The designer should keep in mind, also, the possible utilization of hot-rolled bar stock, as such material can often be used by making a slight change in the dimension of a given cross-section to conform to a standard.

All components, regardless of the method of producing them, are subject to dimensional toler-

ances. The designer must keep this in mind for economy and good fit-up, so that he can control the ill effects of cumulative tolerances. Fig. 23 is a simple illustration of a typical weldment in which the designer has kept cumulative tolerances in mind, the drawing at the left showing a partial cross-section. The drawing at the right shows a similar cross-section in which the effect of cumulative tolerances has been ignored.

Load-Carrying Members

Efficient disposition of material in load-carrying members is of first importance. As an example, the component shown in Fig. 22 at A is less rigid for a given over-all weight than that shown at B. Disposing of the metal as shown at C is still more effective from this standpoint.

Another consideration in the strength factor is exactness of knowledge of the magnitude, direction, and location of dynamic forces with respect to each other and their reactions in the machine. In designing machine parts, particularly for minimum weight, it is important that these factors be determined accurately, and that the material be disposed in the weldment to best advantage.

As an instance, Fig. 24 shows an example of two methods of resisting a torsional force. There is no questioning the effective disposition of metal in a tubular design. Nor is there any questioning that the effective disposition of metal insures the least weight.

Volume of Gear Production High

The gearing industry, as represented by the members of the American Gear Manufacturers Association, shows an increase in volume of sales for November, 1945, of 1.6 per cent, compared with the previous month. This report does not include turbine or propulsion gearing.

Flame-Hardening Set-Up for Small

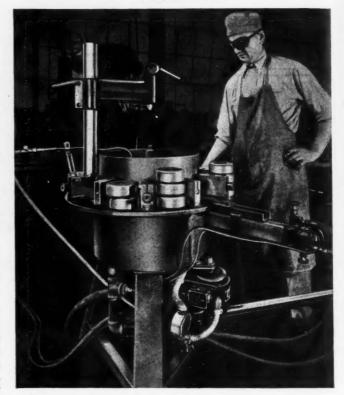
Machined Parts

ISTORTION which formerly resulted from the furnace-hardening of small machined parts has been overcome by a manufacturer of materials-handling equipment through the installation of vertical flame-hardening equipment. This flame-hardening set-up handles small parts, such as gears, rollers, wheels, shafting, pins, and other circular parts having diameters between 1 1/2 and 12 inches. These parts, formerly hardened by furnace-heating, followed by a water quench, were often so distorted after hardening that they could not be used, and in some instances could be reclaimed only by costly grinding operations. The flame-hardening process has virtually eliminated such distortion. As a result, both the rejection rate and finishing costs have been substantially reduced.

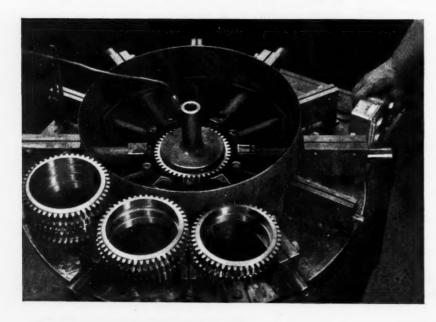
The "spin-hardening" method is used for these parts. With this method, the piece to be hardened is rotated rapidly while being heated by a series of stationary oxy-acetylene flames. When the part has been heated to the correct hardening temperature, the flames are withdrawn, and a spray of water is directed on the work while it is still spinning. This spin-hardening method assures a uni-

form hardened case on the part.

The machine is equipped with six flame-hardening heads. These are separate adjustable units, any combination of which can be used, depending upon the amount and type of heating necessary. For hardening parts such as shafts and pins under 2 inches in diameter, only three heating heads are used. For hardening relatively thin pieces, the number of flames per head can be reduced by replacing the rows of unneeded flame tips with plugs.



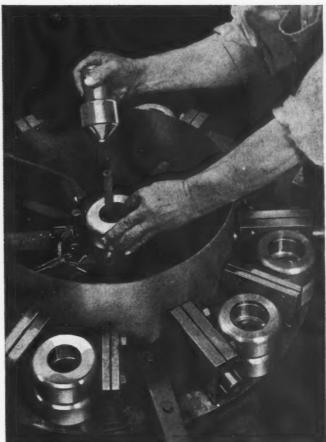
The complete operation is subject to exact procedure control through the use of a special control device, which can be adjusted for each hardening job. The control box and timer are set according to specifications worked out by the engineers, after which the cycle of heating and quenching becomes fully automatic. The heating flames and the water sprays are turned on and off automatically in correct sequence by solenoid valves. The operator merely positions the work and pushes a button to start the sequence of heating and quenching.



Flame-hardening Machine Set up for Gears. The Single Flame Seen back of the Gear being Hardened is a Pilot Light



A Quick-acting Centering Device is Used to Hold Small Work in Place. Only Three of the Heating Heads are Used for This Job

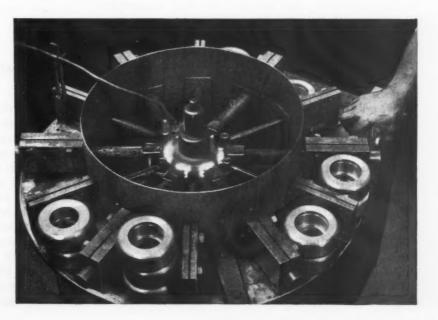


Placing a Work-piece in the Flame-hardening Machine. A Center Fits over the Spindle and Automatically Centers the Work

The work is clamped in position in several ways. For parts such as small-diameter shafts and wheels, a quick-acting centering device is used. For larger work, a tapered center fits over the spindle and centers the work. This center is made heavy enough to hold the work firmly in the machine.

After the parts are hardened, they are tested with a scleroscope. The hardness ranges between 71 to 75 on this scale, which is equivalent to a Brinell hardness of about 540. The depth of hardness varies from 1/32 to 1/8 inch, and can be controlled as desired.

Here the Six Heating Heads of the Vertical Flamehardener are being Used in Hardening a Machined Roller



Just What is the Clayton Formula?

NDUSTRY seems to be only vaguely familiar with the provisions of the Clayton Formula for the disposal of surplus machine tools held by Government agencies. This is probably due to the fact that references to the formula in both the technical and general press have been fragmentary

and incomplete.

The formula, which derives its name from W. L. Clayton, Administrator of Surplus War Property, establishes a system whereby surplus standard general-purpose machine tools twenty-five years old or less are definitely priced. The objective was to establish a pricing policy that would put surplus machines back into production as quickly as possible, create post-war jobs, stimulate national income and wealth, and at the same time recover for the Government as much of its machine tool investment as possible.

The formula specifies that the price of each machine tool be a certain percentage of the original cost of the machine F.O.B. the plant of the machine manufacturer, including the cost of the electrical equipment, attachments provided with the machine, and any special tooling which has a value

other than scrap to the purchaser.

The percentages for machine tools vary for ages ranging from less than one month up to twentyfive years. They are given in the accompanying table. Machines over twenty-five years old are sold at the twenty-five year price or less, or at current market prices. Percentages appearing in column B are applied when the buyer is the concern or person using the machine at the time of the sale, or if the machine is then idle, the concern or person who last used the machine. The five-point difference between the percentages in the two columns arises from the fact that a purchaser of tools in his own plant is under no necessity of paying freight charges, and besides, he has a complete knowledge of the actual condition of the machines being purchased.

Percentages in column A are applied when the sale is made to any buyer other than the user. The differential percentages constitute the difference between the percentage for any listed period and the next following period in the table. All prices are F.O.B. car or truck at the present location of the machines. In the case of machine tools manufactured before March 1, 1941, the price at that date or the price of the nearest equivalent machine at that date is taken as the original price.

The "period of active use" was originally based on the best information reasonably available, and was considered to run from the estimated date that the machine was originally put into use to the date of sale, or if the machine is not in use at the time of sale, to the estimated date when the machine last became idle. A recent Surplus Property Administration interpretation of the regula-

tion covering this point, however, eliminates the necessity of determining the period of active use in its literal sense. The original intention to take into account differentials between tools that have been heavily used and those that saw light use was found administratively impractical for the greater number of the machines to be disposed of.

Le

Prices based on the percentages listed apply to all businesses or other enterprises that are operated for profit. Non-profit institutions or Government instrumentalities in the fields of education. public health, or charity, or volunteer fire companies, are allowed a discount of 40 per cent from the price to all other buyers. It must be remembered, however, that federal, state, and local governments are entitled to this discount only if the machines are intended for the fields mentioned. To qualify for the discount, non-profit instrumentalities must apply to the Federal Security Administration for certification. Non-profit instrumentalities may ask to be put on mailing lists to receive notices of machines as they become available for sale.

Qualified machine tool builders, dealers, and distributors designated as "approved dealers" may participate in the disposition of surplus machine tools and production equipment, and receive for their services a commission of 12 1/2 per cent on most sales effected through their efforts.

The Clayton Formula for the disposal of surplus machine tools serves two admirable purposes. First, it insures that the Government will receive substantial monetary returns for the vast numbers of machine tools which it purchased under the stress of war; and second, it protects the machine tool industry against the dire possibility of several hundred thousand machine tools being thrown on the open market at such low prices that the market for new machines would be seriously curbed.

Lubricant in Piston-Forging Operation Has High Flash Point

In an article dealing with the forging of aluminum aircraft pistons on mechanical presses which appeared in November, 1945, MACHINERY, reference was made to a 30 per cent graphite oil mixed with Gulf Endurance oil in the ratio of 1 to 5. This lubricant is sprayed on a forming tool used in finish-blocking the pistons. A statement in the article mentioned that the oils mixed for this lubricant have exceptionally low flash points and a high lubricating value. Instead, the statement should have read that the oils have exceptionally high flash points and a high lubricating value, in view of the fact that the oils flash at between 400 and 495 degrees F.

Formula for Determining Prices of Standard, General-Purpose Surplus Machine Tools

Surplus Property Administration Regulation 13, November 2, 1945

The Percentages of Original Cost to be Applied are as Follows:

Period of Active Use	Differential Per Cent	A Per Cent	B Per Cent	Period of Active Use	Differential Per Cent	A Per Cent	Per Cent
	0.1.0	07.0		10 11	74	44.4	40.1
Less than 1 mo.	2 1/2	85.0	90.0	43 months	0.5	41.1	46.1
1 month		82.5	87.5	44 months		40.6	45.6
2 months		80.0	85.0	45 months		40.1	45.1
3 months	1 - 1	77.5	82.5	46 months		39.6	44.6
4 months		75.0	80.0	47 months		39.1	44.1
5 months		72.5	77.5	48 months		38.6	43.6
6 months		70.0	75.0				
				49 months	0.4	38.2	43.2
7 months	1	69.0	74.0	50 months		37.8	42.8
8 months		68.0	73.0	51 months		37.4	42.4
9 months		67.0	72.0	52 months		37.0	42.0
10 months		66.0	71.0	53 months		36.6	41.6
				54 months		36.2	41.2
11 months	0.8	65.2	70.2				
12 months		64.4	69.4	55 months	0.2	36.0	41.0
13 months		63.6	68.6	56 months		35.8	40.8
14 months		62.8	67.8	57 months		35.6	40.6
15 months		62.0	67.0	58 months		35.4	40.4
16 months		61.2	66.2	59 months		35.2	40.2
17 months		60.4	65.4	5 years		35.0	40.0
18 months		59.6	64.6	o jears		00.0	40.0
19 months		58.8	63.8	6 years	1	34.0	39.0
20 months		58.0	63.0	7 years	1	33.0	38.0
21 months		57.2	62.2	8 years		32.0	37.0
22 months		56.4	61.4	9 years		31.0	36.0
23 months		55.6	60.6	10 years		30.0	35.0
24 months		54.8	59.8	11 years		29.0	34.0
25 months		54.0	59.0	12 years		28.0	33.0
26 months		53.2	58.2	13 years		27.0	32.0
27 months		52.4	57.4	14 years		26.0	31.0
28 months		51.6	56.6			25.0	30.0
29 months		50.8	55.8	15 years 16 years		24.0	29.0
30 months		50.0	55.0	17 years		23.0	
31 months		49.2	54.2			22.0	28.0
32 months		48.4	53.4	18 years			27.0
33 months		47.6	52.6	19 years		21.0	26.0
34 months		46.8	51.8	20 years		20.0	25.0
35 months		46.0	51.0	21 years		19.0	24.0
36 months		45.2	50.2	22 years		18.0	23.0
oo months		10.2	00.2	23 years		17.0	22.0
37 months	0.6	44.6	49.6	24 years		16.0	21.0
38 months	0.0	44.0	49.0	25 years		15.0	20.0
39 months		43.4	48.4			-	
40 months		42.8	47.8				
41 months		42.2	47.2				
42 months		41.6	46.6				

Percentages in Column B are applied when the buyer is the concern or person using the machine at the time of sale or, if the machine is then idle, the concern or person who last used it. Percentages in Column A

are applied when the sale is to any buyer other than a user. The differential percentages constitute the difference between a percentage for any listed period and the next following period.

Forging with Closed Dies in Hydraulic Presses By C. W. HINMAN, Designing Engineer

TODAY, steel and non-ferrous metals can be forged to shapes and depths heretofore thought impossible. A process that has gained favor in industry is that of using closed dies in hydraulic presses for the forging operation. Forgings produced in this way are not limited to ferrous metals alone; aluminum, magnesium, brass, and other non-ferrous alloys can be forged into

deep, intricate patterns in closed dies.

Closed-die forgings made in the hydraulic press are produced by pressing and squeezing the metal into the dies rather than by using several impact blows, as is necessary in drop-hammers. The metal, being forced into the dies under pressure, fills all the corners and cavities. The prepared blanks have a greater volume than the die cavities. This produces a forging with an overflow flash or fin which is subsequently trimmed off. Using a properly heated blank of sufficient volume, the forging will be fully complete in every detail. The heated blanks are sometimes known as "cogs."

There is little difference between the design of

forging dies for hydraulic presses and those used in drop-hammers. The only important difference is that more draft is necessary for the removal of the piece from drop-hammer dies. Dies for hydraulic press forgings, having less draft, are simpler and cheaper to finish.

A huge hydraulic press used for forging operations is shown in Fig. 1. This press is built by the Hydraulic Press Mfg. Co. Previous to the development of such large presses, press forgings were necessarily confined to small and medium-sized parts. Also, they had to be more easily formed, symmetrical shapes, not too deep, so that the smaller hydraulic or mechanical presses could handle them. Larger parts were then regularly forged in drop-hammers.

The advantage claimed for the hydraulic press is that it delivers a steady squeezing pressure on the metal as it flows into the die cavities. Ordinarily, only one stroke of the press is sufficient to forge a piece if the blank is properly heated. As mentioned, the size of the forging is no longer

> a limiting factor. Hydraulic presses used for forgings have been built in capacities up to 5000 tons, and much larger presses are under consideration at the present time.

> The press illustrated has a rapid twostage action with a closing and opening speed up to 1200 inches per minute. The full-tonnage forging speed is 350 inches per minute, and this speed can be stepped up when necessary. However, a 125-inch per minute forging speed is usually satisfactory, although the faster speeds may be used for special operations.

Tests have shown that the structure, grain flow, and ultimate strength of hydraulic-press forgings are equal to those produced by other means. The very high skill required by the smith operating a drop-hammer or a steam hammer is not needed by the hydraulic press operator. The press speeds, forging pressure, and die travel are automatically controlled. Since it is impossible to exceed the pressure-setting of the press, the dies never become overloaded. This reduces the hazard of fracturing the dies to a minimum.



Fig. 1. A 2000-ton Fastraverse Closeddie Hydraulic Forging Press which is Completely Self-contained

Fig. 2. An Aluminum
Forging Made in Three
Operations — Pre-block,
Block, and Finish and
Trim. This Forging
Weighs 26.6 Pounds. The
Average Production is
400 Forgings in an
Eight-hour Day



Fig. 3. A Group of Typical Aluminum Forgings Produced in Closed Dies on a Hydraulic Press

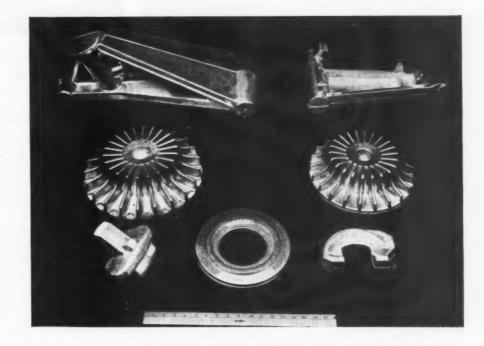


Fig. 4. Aluminum Mani-Jold for an Aircraft Oxygen System, Produced by Forging in Three Steps, as Indicated. A Pressure of 750 Tons is Required to Forge This Part in a Hydraulic Press





Fig. 5. A Forging Made from X-4340 Steel at 2200 Degrees F. in a Hydraulic Forging Press



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Fig. 6. An Aluminum Cylinder-head Forging for a Radial Aircraft Engine, Finished and Trimmed

Cases are on record where 50,000 aluminum forgings have been made in one set of dies in a hydraulic press. Minor repairs, of course, were made in the meantime. At times, small cracks develop in the die corners, and these are welded and machined to a smooth surface, but it is not necessary to rework the dies completely. The steel used for the dies is a high grade of chromium-nickel-molybdenum alloy, drawn to from 1150 to 1200 degrees F.

The numerous photographs of intricate press forgings shown in the accompanying illustrations were furnished to the author through the courtesy of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, which firm has built numerous presses for die forging of the kind described in this article.

OPA Cannot Change Economic Principles

Government is insisting upon maintaining price controls. The theory is that this will prevent inflation. The fact is that if costs go up, prices go up; and no man-made law can alter this basic principle. Nobody is going to do business at a loss if he can help it.

Today, the demand for higher wages and shorter hours—unaccompanied by the understanding that a man should do a full day's work for a full day's pay—plus price increases in materials and supplies is pushing costs in many cases close to, or even above, the break-even point. When that happens, production stops, jobs stop, and we head into a tailspin.—George T. Trundle, Jr.

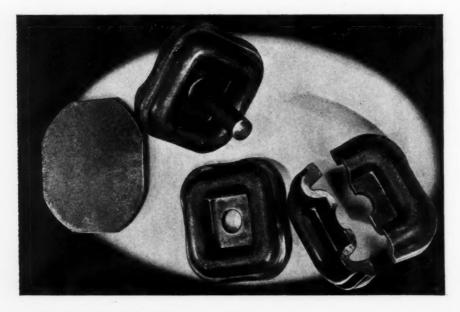


Fig. 7. Steel Forgings
Made in a 300-ton Hydraulic Press. Thirtysix Hundred of These
Hand-hole Covers for
Steam Boilers are Produced in a Twenty-four
Hour Day

Rapid Grinding of Milling Cutters for Continuous Production

I N a paper read by Arthur A. Schwartz, chief tool research engineer of the Bell Aircraft Corporation, Buffalo, N. Y., before the recent annual meeting of the American Society of Mechanical Engineers, attention was called to the need for methods by means of which the teeth of milling

cutters can be more rapidly ground.

In the introduction to the paper, the author called attention to the drive started some five years ago for reducing the number of teeth in milling cutters and for the more general adoption of cast or soft steel bodies with brazed teeth. The slogan in those days was "a healthy bite for every milling cutter tooth." The number of teeth was limited to what could be advantageously used with the motors and spindles of the machines available, without overloading, still making the feed such that each tooth would take a real cut. More recently conducted tests have proved that this was a correct procedure.

Later, those whose business it was to study economical milling performance noted that an exceptional amount of time was spent on grinding milling cutters. This was because of the long time required to grind one cutter and the short life of the cutter between grinds. In order to at least partially remedy this condition, the author stated that three things are necessary: (1) A quicker and simpler way to sharpen cutters to eliminate perhaps as much as 80 per cent of the time now required for sharpening. (2) A simple system of blade insertion and locking that will insure that the newly ground tooth will be seated exactly the same as every other tooth of that series. would eliminate up to 95 per cent of the set-up time now required when cutters are changed. (3) A simple method of production and precision grinding of teeth.

At the Bell Aircraft plant, a system has been developed which has proved efficient and workable. Briefly, the procedure adopted was as follows: A separate grinding body was made with as many blade-receiving slots as it was possible to put around its periphery, all these slots being closely alike in dimensions, angles, and radial distance from the center. A fixture was also made for holding and for spinning or revolving this grinding body after the blades had been placed in it. In operation, the blades are rough- and finish-ground, the ends being ground cylindrical. Shapes and contours, when required, are controlled by a templet attached to the fixture and operating against a nib fastened to the table of the grinding machine. A still better way is to have a drawing or photograph in a comparator attached to the fixture.

By this method, the teeth or blades of two or more cutters are ground at once, depending on the

number of teeth used in each cutter and the number held at one time in the grinding body. Suppose the milling cutter has four teeth and the grinding fixture can hold sixteen. This means that four cutters are ground in the time that the teeth in one grinding body are being completed. It has been possible to achieve an 80 per cent saving of grinding time in this manner.

In the milling-cutter body, the four slots must be exactly the same in dimensions, angles, and radial position as the slots in the grinding body; but there must be a 5-degree angular difference between the position of the slots in the cutter body and the grinding body. This change in position produces the clearance. A 5-degree clearance is employed both radially and axially.

This system of grinding, with a body holding a large number of teeth or blades, and the blades so positioned in the grinding body that an ideal edge clearance is automatically produced, gives proper

relief with maximum lip strength.

It has constantly been noted that the cutting edge of a tool chips, and that grinding cracks appear in or near the cutting edge when present methods of grinding are used. With the system of grinding just described, such cracks and chips are easily avoided. Since carbide is hard and brittle, the grinding can now be done with proper consideration of the feeds to be used, and the relief not only saves the cutting edge from chipping or cracking, but the tooth has a smooth shiny surface that adds to the tool life.

In order to have these blades operate at high efficiency, it is necessary to hold them solidly in the cutter body, to back them up firmly, and to make it possible to take them out and put them in quickly. The blades used are of very simple construction—just a wedge-shaped piece of metal held in a plain slot by an opposing wedge.

To summarize, in order to secure the results that have been obtained at the Bell Aircraft plant, it is only necessary to cut the slots in the cutter body and in the grinding body at one setting of the mill-

ing machine.

. . .

We hear much talk of "full employment" and of a post-war boom. How much discussion have you heard about how we are going to pay for this most costly of all wars? Let us make no mistake. We must pay the most fantastic debt ever created in the world's history with one coin or another. The choice of coin lies between drastically reduced living standards and immensely increased productive efficiency.—Louis Ruthenburg

Cam Grinding on a Cylindrical Grinder

By FRANK ZAGAR, Vice-President of Zagar Tool, Inc., Cleveland, Ohio

URING the war years, many machining problems were encountered, particularly in aircraft work, that involved a considerable departure from conventional methods. Such a problem was the grinding of the cam surfaces on the part shown to the left in Fig. 2, which is used in a coupling device on a bomber. The specifications called for a definite radius to be blended perfectly with the two flats on the sides. The mechanical action of this part is performed chiefly at the spot where the radius and the flat blend; therefore, it was essential that the blending be extremely accurate and smooth. Obviously, the only possible way to obtain such a result is by grinding.

The conventional method of producing such a surface would be to first grind the two flats and then attempt to grind the radius so that it would blend both with the flat and with the outside cylindrical surface. This method was tried for a considerable length of time until it was

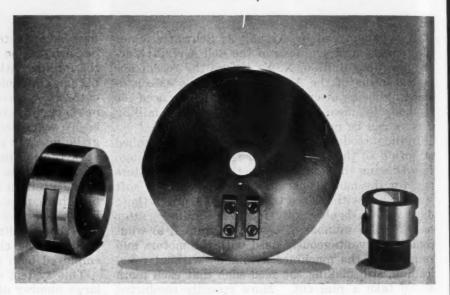


Fig. 1. Cam-plate in Center, and Parts Ground by Fixture Described Shown at Right and Left

concluded that the best way to do this work would be to consider the entire cam surface as a unit, and grind both the flat and the radius at the same time.

Being somewhat limited in equipment, as most shops were during the war, it was decided to make

> an oscillating spindle which would move toward and away from the rotating grinding wheel, thereby producing the two flat surfaces and also the blended curved surfaces. Fig. 2 shows the front view, and Fig. 3 the rear view of a fixture built to accomplish this purpose. The cost of this fixture, including engineering and tool-room time, did not exceed \$400. Later, the same idea was adapted to the grinding of some of the standard parts used in our company's own products as, for example, the parts shown in Fig. 1, which are used in collet indexing and holding fixtures.

In Fig. 2, it will be noted that the fixture is actuated principally by a large cam-plate and a roller, the cam-plate being also shown in the center of Fig. 1. The unit is driven by the conventional pin type driver mounted on a faceplate (see Fig. 3). This pin moves back and forth in an elongated slot in the two

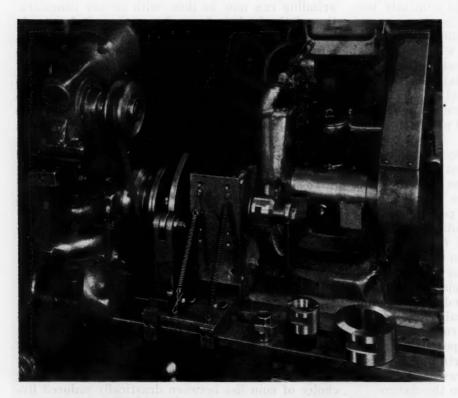


Fig. 2. Front View of Grinding Fixture, Showing Cam-plate and Roller by Means of which Work-spindle is Oscillated

blocks on the large cam-plate, as shown most clearly in Fig. 1. The spindle of the fixture holding the cam to be ground is oscillated by the contour of the large cam-plate as it bears against the roller shown in Fig. 2. The unit is held against this roller by two springs, as shown. The design may seem to be decidedly "homemade," but this is just the secret of success in rapidly building a useful tool in an emergency.

A slow-speed motor was mounted on the work-spindle head, as it was found that, when grinding by this method the work had to revolve slowly, because at the point where the work to be done was the heaviest—that is, on the two flats—the work passed by the wheel most rapidly; hence the work-holding spindle rotated at approximately 60 R.P.M.

In working out this problem, the greatest difficulty was to obtain a correct shape on the large cam-plate. More time was spent in obtaining a correct cam-plate than on the whole fixture. To get the correct outline of the cam-plate, we started with a full-sized wheel, such as was to be used for the grinding, and a finished part like the one to be made, which had been hand-finished in the toolroom. With the grinding wheel standing still, a scriber was put in place of the cam roller and the finished work-piece was held against the grinding wheel and revolved against it. In this way, the scriber traced off on the large cam-plate the exact contour required.

After this line had been scribed on the large cam blank, the surplus metal was removed roughly, and then the cam surface was hand-filed and handpolished until an even, smooth shape was obtained

all around. The first cam-plate thus shaped was found to be off as much as 0.010 inch on one side, compared with the other. These irregularities were gradually removed until a cam had been obtained that produced perfect work-pieces.

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In a case of this kind, the most practical method is to make the cam-plate in the machine itself, as it is difficult to determine exactly all the factors that enter into the development of the cam if an attempt is made to work out the cam shape on a drawing-board. One factor that would have to be considered if an attempt were made to draw the exact shape on the board is the exact height of the center line of the wheel with relation to the center line of the rotating fixture spindle. Another point is that the driving pin on the faceplate slides back and forth in the slot of the cam-plate, and therefore the cam-plate speed is not constant.

It will be noted in the illustrations that conventional pillow-block bearings are used in the fixture. Some 16,000 work-pieces were produced without any replacement of the pillow-block bearings. By the use of these bearings, a considerable amount of time and money was saved.

The method described proved so successful that it was immediately considered for other applications. Considerable difficulties had always been experienced in grinding the flats on the collet bushings for the collet fixtures regularly manufactured in the plant, as shown in Fig. 1. These flats had to be sized as to width and also had to be in proper relation to the center of the bushing. This work was handled in the grinding attachment with a new cam-plate made for the job. The production of collet bushings was approximately doubled.

Machine Design Group Formed by A.S.M.E.

Recognizing the increasing importance of the field of design, the American Society of Mechanical Engineers has sponsored the formation of a Machine Design Group. This group was organized primarily for the presentation of technical papers of interest to machine designers generally rather than to any specific branch of industry. The chairman of the group is J. F. Downie Smith, head of the engineering department of the United Shoe Machinery Corporation's Research Division, and the secretary is B. P. Graves, director of design of the Brown & Sharpe Mfg. Co.



Fig. 3. Rear View of the Cam Grinding Fixture Illustrated in Fig. 2



Henry Ford II, President of the Ford Motor Company

HE ability of American industry to produce has never before been so clearly recognized as it now is. The job of war production has been called a miracle. The mechanical means that made possible this war production record are not new to American industry. Briefly, they are standardization of parts, line assembly, and the use of highly developed machine tools. These are the means that have been used for many years in the manufacture of automobiles; they are the principles of mass production. But mass production is not an end in itself; it is a means to an end. It is a tool. In peacetime, the use of the tool of mass production thrives best in a highly competitive democratic economy, because mass production is a tool which a free people can use in peacetime to make more and better products at less and less cost. It is a tool for raising the standard of living.

What do We Mean when We Speak of a High Standard of Living?

The standard of living is not a question of money or wages, but of things and opportunities. A nation enjoys a high standard of living when great numbers of its citizens can afford a great many things and services—homes, good food, education, recreation, automobiles, refrigerators, radios, and all the rest. Through the peacetime use of the tool of mass production, American industry has made this country a land with an incomparably high standard of living.

We have in no way reached the limits of our ability to bring, through mass production, millions of things and opportunities within the price range of most of our people. We continually talk about higher incomes, higher wages, and more money. It is all right for a man to be ambitious. He should try to increase his income, but in our discussion of higher incomes we must never lose sight of the fact that the universal advantage is lower costs—that more and better products be brought within the budget of more and more people.

The Human

Machines alone do not give us mass production. Mass production is achieved by a combination of machines and men. We have gone a very long way toward perfecting our mechanical operations, but we have not been so successful in making full use of the abilities of man in our mass production achievement.

If we can solve the problem of human relations in industrial production, we should be able to make as much progress toward lower costs during the next ten years as we made through the machinery of mass production during the last twenty-five years. In making this possible, labor has a great opportunity to achieve stature through assuming greater responsibility.

The Serious Waste of Human Effort Caused by Industrial Strife

How badly we have handled our asset of human efforts is indicated by definite available figures. The Department of Labor tells us that a total of 216,000,000 man-days were lost between 1927 and 1941 as a result of strikes alone. I am not here questioning the justice or injustice of these strikes. I am merely quoting the fact that 216,000,000 mandays of work were lost. This idleness was expensive to the strikers, to the employers, and to the nation. The cost was part of the cost of production of all the things that we use and enjoy. Consider how many thousands of automobiles, radios, refrigerators, and other useful and needed products could have been manufactured with 216,000,000 mandays of labor. Or, to put it in another way, consider how much lower would have been the cost of the things that were manufactured if production had not had to absorb the expense of these work stoppages.

Furthermore, when a production line stops, the jobs and purchasing power of hundreds of thousands of people in related businesses all over the country are affected.

Productivity of Individual Workers has been Reduced Instead of Increased in Recent Years

Costs are closely related to the productivity of the individual American worker. We take pride in this productivity, but we shall not be able to compete in the world's markets with our high wage rates if the American worker does not continue to be productive. At the end of the war, our productivity per man was not as high as five years previously. This was partially due to the fact that the war necessarily brought into industry a great many inexperienced men and women and the armed forces took away a great many skilled workers. Nevertheless, recent records of productivity are not encouraging. Detailed records of the time it

Factor in Mass Production

Abstract of an Address by Henry Ford II, President of the Ford Motor Company, Presented before the Annual Meeting of the Society of Automotive Engineers

takes to perform various operations have been kept by the Ford Motor Co., and these records indicate that there is need for improvement in the matter of individual productivity.

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One group of operations that took 96 minutes in 1940 took 128 minutes five years later. Another group that took 1188 minutes in 1940 required 1943 minutes five years later. In another case, work that took 28 minutes to perform in 1940 took 49 minutes in 1945. On the whole, the productivity per worker in the Ford Motor Co.'s plants declined more than 34 per cent during the war period. These figures demonstrate how great is the need for improvement in this direction.

A Common-Sense Program for Labor and Management

Let me add that if we cannot succeed by cooperation, it does not seem likely that we can succeed by any exercise of force. We cannot expect legislation to solve our problems. Laws that seek to force large groups of Americans to do what they believe is unfair and against their best interests are not likely to succeed. In fact, such legislation is likely to lead to exaggeration of the very problem it is designed to solve. When free men give up the task of trying to get along with each other and "pass the buck" to Government, they surrender a substantial measure of their freedom.

As a starting point for continuing efforts in the direction of cooperation, perhaps management and

labor could today agree on the following points:

1. That the job of American industry—management and labor—is to make at lower and lower cost more and better products, to sell for lower and lower prices.

2. That the only way in which that job can be done is through understanding and cooperation between management and labor.

3. That the spirit of that cooperation must be a sense of joint responsibility. The public is the "boss," not management or labor. Both labor and management must accept their share of responsibility to the public welfare and live up to their commitments.

4. That mass production has demonstrated its ability to bring high wages, and that higher wages can come only out of greater production and lower costs.

5. That while no single human institution or industry can promise complete security, because of the complexity of modern civilization, management and labor can work toward more certain, more stabilized employment.

6. That American industry should be a place of opportunity—a place in which men and women can grow and develop their capabilities to hold better

If management and labor can live up to these articles of industrial faith, then we can make mass production more efficient. Let us apply as much attention to human effort as we have given so successfully in the past to mechanical factors.

Synthetic Oils Developed for Industrial Purposes

AT the recent annual meeting of the Society of Automotive Engineers, J. C. Kratzer of The Linde Air Products Co., D. H. Green of the National Carbon Co., and D. B. Williams of the Carbide and Carbon Chemicals Corporation described two series of synthetic lubricants produced from natural and other hydrocarbon gases through research that was initiated nearly twenty-five years ago.

One of the new lubricant groups is known as the LB series. These lubricants are insoluble in water, and are adapted for the lubrication of machinery, including internal-combustion engines. They have a low pour point, high viscosity index, and non-sludging characteristics—qualities which adapt them for use as hydraulic fluids and as

lubricants for powdered-metal bearings, transmissions, differentials, electric motors, textile machinery, and wire-drawing, metal-rolling, and metal-stamping operations. Greases exhibiting unusually high and low temperature properties have been made experimentally with these oils.

The other group of lubricants is known as the 50-HB series. These lubricants are soluble in water. They are said to give excellent service on both rubber and metal, having been found satisfactory as brake fluids and cutting oils. An advantage claimed for both series is that it is possible to exercise exact control during manufacture over viscosity and pour point. The new synthetic lubricants are said to be somewhat higher in cost than the best petroleum lubricants.

Automatic Welding Process Increases Production Threefold

AMANUFACTURER of water supply equipment has increased his production of shutter type strainers for use in deep water well pumps 300 per cent by replacing the former combination of mechanized and hand arc welding with the Unionmelt electric welding process, developed by The Linde Air Products Co., New York City. It is said that superior appearance and improvements in weld quality were also obtained with the automatic welding installation.

The first step in the fabrication of the shutter type strainers is roll-forming the 3/16-inch thick ingot iron sheets into cylinders, as illustrated in Fig. 1. The longitudinal seams of the cylinders are then tack-welded. Fig. 2 shows a rolled form with the joint tack-welded, in position for making the longitudinal weld. When the previous method was employed, this seam was arc-welded by the use of the automatic welding head shown in Fig. 2. With slight alterations, the same head is now used for Unionmelt welding of the seam at a speed of 35 inches per minute.

After seam welding, the cylinders are slotted to form the shutters. Several cylinder sections are then joined to make a strainer unit by fillet welding connecting bands of the same material as the sections to the ends of each section. This joining procedure was formerly a hand arc-welding job. The fillets are now welded automatically while the strainer unit is rotated at a uniform speed on motor-driven rollers, as shown in Fig. 4. The sta-

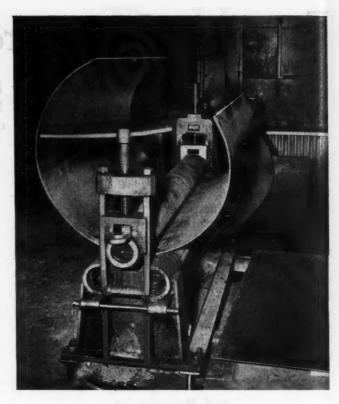


Fig. 1. Forming Sheets into Cylinders for Use as Shutter Type Water Strainers

tionary welding head and rod reel are supported above the work by a pillar crane arrangement. A "melt recovery" unit is used to collect the unfused Unionmelt material for reuse.

The fillet welds on the connecting bands are made by a Type U Unionmelt welding head, as shown in Fig. 3. The entire welding action takes place beneath the granulated material without any visible arc and without sparks, spatter, or fumes. Hence, the operators need no protective helmet,

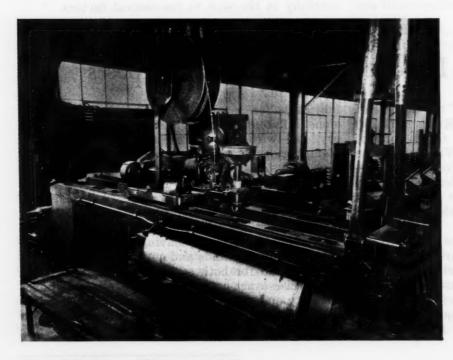


Fig. 2. Cylinder in Position for Automatic Welding of the Longitudinal Seam, which is Accomplished at a Speed of 35 Inches per Minute



Fig. 3. Close-up View of the Unionmelt Head Welding the Fillets on the Connecting Bands of the Strainers

goggles, or special equipment. All the necessary controls are on the welding head, within convenient reach. Bare welding rod is automatically pulled by the welding head from the 25-pound rod reel shown in the upper part of Fig. 3. Little or no subsequent cleaning is required, the strainers being ready for painting and shipment upon the completion of the welding operation.

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The procedure described is an excellent example of the possibilities of automatic welding.

Progress in Honing Technique

In a paper read before the annual meeting of the Society of Automotive Engineers in Detroit, Lawrence S. Martz and Douglas T. Peden of the Micromatic Hone Corporation, outlined in some detail the latest developments in the honing process. In this paper, it was mentioned that reproducible uniform accuracy can'be obtained by honing in bores 4 inches in diameter and larger within tolerances of from 0.0005 to 0.001 inch for roundness and straightness. In bores from 1 inch to 4 inches in diameter, these dimensions can be held to within 0.0003 to 0.0005 inch; and in bores below 1 inch in diameter, the roundness and straightness can be held well within 0.0003 inch, and in some jobs as low as 0.00005 inch.

The amount of metal now removed by honing is remarkable. Today, in some instances from twenty-five to thirty times as

much metal is being removed by honing as was formerly thought practicable; and in certain applications, this additional metal removal is accomplished much faster than was ever thought possible in the past. The heavier, faster stock removal has been accomplished by two specific methods—the provision of better bonding material in the hones; and multiple and progressive honing, using two-and three-spindle machines which are equipped with rotating indexing fixtures.

Fig. 4. Cylinders Joined together to Form Strainer Unit, which is Rotated on Motor-driven Rollers to Facilitate Automatic Fillet Welding



Engineering News

Blade-Tip Velocity in Steam Turbines Greater than the Speed of Sound

In a steam turbine, the limit to volume of steam flow, and hence the economical capacity of the turbine, is determined by the length and diameter of the blades in the last row. As the blades become longer, the centrifugal forces tending to pull them out by their roots become enormous, and the velocity of the tips at high speeds is very great.

Heretofore, the longest blade for a 3600-R.P.M. turbine has been 20 inches. The Westinghouse Electric Corporation is now conducting tests with blades 23 inches long. At a speed of 3600 R.P.M., these blades have a tip velocity of 1520 feet per second, which is about one-third greater than the speed of sound. Blades of this length will make possible steam turbines that can deliver 40,000 K.W. from a single-cylinder 3600-R.P.M. condensing unit, or 80,000 K.W. from a tandem 3600-R.P.M. unit. These outputs compare with 30,000 and 65,000 K.W. of the present largest 3600-R.P.M. machines.

Light-Weight Small Boats Made Possible by Plastic Materials

A small boat, light enough so that it can be lifted easily to the top of an automobile for a weekend fishing trip, and yet stable enough so that children can use it safely, is being made by the Winner Mfg. Co., Trenton, N. J., by using plastic resins, canvas, and sisal. A low-pressure method of laminating is used in the construction. The hull, as stripped from the mold, weighs 73 pounds, and with woodwork, seats, and trim, the boat weighs less than 150 pounds, so that two people can handle it conveniently. It measures 10 feet in length and has a 4-foot beam. The canvas duck and sisal fiber matting are impregnated with a compound having Bakelite polystyrene laminating varnish as a base. The boat consists of a solid shell made without any metal or other fastenings. It is formed in a mold with a pressure of less than 50 pounds per square inch.

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Unusual Application of Carbide Tools Keeps Shop Floors Smooth

A Carboloy-tool rotary floor scraper was devised by a large industrial plant to remove embedded dirt, oil, metal chips, and even inequalities in the concrete itself. Actual removal of the material is accomplished with a four-bladed fly cutter, built up of four standard Carboloy 1/2-inch, T-18 tools, tipped with grade 78-B cemented carbide.

The cutter-head is driven at approximately 100 R.P.M. by an air motor. The head is adjustable up or down by means of a handwheel. Cutter and motor are mounted on a small four-wheeled truck.



Interior View of a Surface
Combustion Lift-cover, Carbottom Furnace Used for the
Heat-treatment of High-alloy
Rod and Bar Stock. Through
the Use of Radiant-tube Heating Elements Located along
Each Side and Beneath the
Charging Surface of the Car,
and the Inert Nitrogen Gas
Atmosphere Utilized within
the Furnace, the Heat-treated
Surfaces are Free from Scale
and Decarburization

A steel guide ring was incorporated into the cutterhead to control the depth of cut and thus prevent undue cutting away of the concrete floor. This revolving steel guide ring was protected against abrasion by inserting four 3/8- by 1/2- by 1-inch standard, Grade 44-A, Carboloy blanks. The four tools that do the scraping project 1/16 inch beyond the four blanks set in the guide ring.

Backing-Up Roll of Roll Grinder Floats on Oil Film

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Starting load caused by inertia and friction is reduced in the two 60-inch by 24-foot Farrel-Birmingham roll grinders installed in the plant of the Geneva Steel Co., Provo, Utah, by the use of hydraulic pressure relieving devices. These devices actually float the 63-ton backing up rolls of the grinders on oil by forcing a film of oil between the roll necks and the bearing surface of the neck rests.

The bearing blocks or gibs of the neck rests are made of cast Meehanite with babbitted bearing surfaces. The bottom gib is bored in place in the neck rest stand, and pivoted to insure accurate alignment and uniform bearing against the roll neck. Openings in the bearing surfaces permit the entry of the lubricating oil under pressure.

The gibs are adjusted separately from the front of the neck rests by means of adjusting screws turned by a ratchet socket wrench. A graduated dial is provided on each adjusting screw for making close adjustments.

Oil is supplied to the bottom gib by a separate motor-driven pump. The control for the oil-pump motor is interlocked with that of the headstock motor. Pressing the starting button for the headstock motor starts the oil-pump first, and the headstock motor starts automatically after a predetermined pressure is reached. The oil pressure can be varied according to the weight of the roll, and after the roll is started, the pressure is reduced to the amount required to provide adequate lubrication to the roll neck. The pressure is adjusted by a manually operated valve in the oil line, and a gage is provided to indicate the pressure.

Gas Turbines Built for Experimental Use on Locomotives

The Westinghouse Electric Corporation is building a 2000-shaft-H.P. experimental gas turbine for use on railway locomotives. At least two of these units will be installed in a single locomotive. The new unit is the simplest form of gas turbine, and the power is conveyed to the locomotive driving axles through generators and motors. The gas turbine power output is several times that of a Diesel engine of comparable weight and size, and the gas turbine is competitive with the Diesel engine in fuel cost. Since the gas turbine has no sliding parts, the maintenance costs should be low. It is recognized that this prime mover is so new

and untried that it is not possible to predict the extent of its acceptance for railroad locomotive power service.

Magnesium Used as a Substitute for Wood

An unusual application of magnesium has been made by the Dow Chemical Co., Midland, Mich. Magnesium is replacing wood as a material for skis. The new skis are lighter and are claimed to permit of higher speeds than the conventional wooden skis. Other advantages claimed over wood are durability and freedom from splintering, warping, and water-soaking. Magnesium is said to be the only metal light enough to replace wood.

Sodium-Hydride Process for Descaling Metals

After years of laboratory research and practical experience, the E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has developed a sodium-hydride process for descaling metals. In principle, this is an alkaline pickling bath which requires no electric current. The process is said to have many advantages over the usual acid pickling for alloy steels and particularly for stainless steels.

The advantages include shorter time for descaling, elimination of the possibility of pitting the metal through careless handling, and a saving of from 2 to 3 per cent of the steel which may be lost through the action of the acid. The scale, reduced by the sodium hydride dissolved in fused caustic, virtually is blasted from the surface of the metal by the generation of steam in a subsequent water quench. Only a few seconds' dip in acid to brighten the surface remains to be done. The sodium hydride is effective on such metals as nickel, cobalt, and copper, as well as on alloy and stainless steels.

The following nine advantages are claimed for the process: (1) The bath, containing active sodium hydride, penetrates throughout the work and uniformly descales all surfaces; (2) all grades of alloy steels can be descaled and different grades can be descaled interchangeably, using the same procedure; (3) there is no loss of metal, as in other pickling processes; (4) no harm will result from too long treatment, because the hydride bath does not pit the work; (5) since the bath does not attack metal at its working temperature, an ordinary low-carbon steel tank can be used; (6) no electric current is necessary; (7) the working temperature of 700 degrees F. is sufficiently low so that there is no deleterious effect on the structure of the metal; (8) the hydride bath does not produce hydrogen embrittlement of the steel; and (9) important savings are affected in time, space, and ease of disposal of waste residue.

The use of the process has previously been restricted because of the critical war need for sodium. Now it is available for general use.

Editorial Comment

Labor union leaders have been extremely busy of late making plans for raising the prices of all the things that the members of their unions buy and use. This is not a statement made out of thin air; it is based on the past experience of every one of us, and on the simplest kind of common sense.

When Higher Wages Mean Higher Prices No One Benefits When wages go up, the manufacturer has to find the money somewhere with which to pay the higher wages. He must charge more

for what his factory makes and sells. The same is true of the builder; he must get more for the houses that he builds—and this happens all along the line.

If union leaders are successful in obtaining the demanded wage increases, the members of the unions will very shortly find themselves confronted with increased prices for practically everything they buy; and since union members constitute the largest single group of consumers (except farmers, who also will be faced by price increases and must get more for the food they raise and sell), the benefits derived by labor will be of short duration.

Union leadership is attacking the wrong end of the problem. The methods used by union leaders for benefitting their membership unfortunately are of no value unless prices remain the same.

Only Greater Production Can Keep Wages Up and Prices Down There is one method, and only one, by which prices can be made to remain the same in spite of increased wages, but of that method we

hear nothing from labor leadership. If it were possible to increase the hourly production per man in the same proportion as the hourly wages are increased, then prices could remain the same, and the higher wages would buy more goods. In that way, labor would truly benefit by the advances made in production equipment and methods.

This point is missed not only by union leaders but also by a great many men who occupy high positions in Government. The political or labor leader who sincerely wishes to benefit labor should put chief emphasis on increased production per man. Then labor, as the chief consumer, would actually be able to obtain higher wages, not only in dollars and cents, but in the things that the dollars and cents buy. If the things that all of us use can be produced at a lower price, competition

will see to it that they will be sold at a lower price, and the buyer will get more for his money; but when wages increase and production remains the same, the buyer is bound to get less for his money, even though he may deceive himself by the fact that he handles more dollars and cents.

Certain provisions in the new British income tax act which goes into effect April 6 will have a profound effect on British industry and on the modernization of British factories. These provisions, generally speaking, have for their objective

British Tax Policy Encourages Buying Modern Equipment the removal of some of the financial obstacles to the modernization of British industry—obstacles which, by the way, our tax laws have for years placed in

the way of the modernization of American manufacturing plants.

One of the important effects of the new British income tax act will be to liberalize the present requirements with respect to depreciation and obsolescence of factory equipment, with a view to speeding up the replacement of obsolete machinery. The other important provision is that industry will be relieved from taxation on all expenditures for research—from the fundamental research to the final development of the product. This provision should greatly encourage scientific and engineering progress.

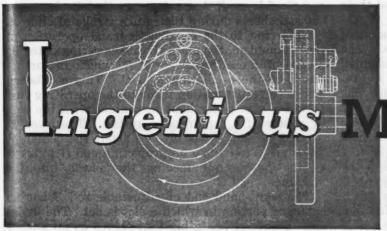
As referred to in an editorial on page 182 of January MACHINERY, the Government can, on the one hand, encourage the modernization of industry by large depreciation allowances, which would

Up-to-Date Plants
One Way to Assure
Full Employment

stimulate the installation of efficient and up-to-date machinery, or on the other hand, discourage the buying of equipment by too low depreciation

percentages, which means an additional tax burden imposed on the equipment buyer.

Our entire system of taxation needs revision. It is of particular interest to note that the socialistic government of Great Britain is taking this step to encourage private industry to modernize and become more efficient, while the Government of the United States, professedly committed to the furthering of individual enterprise, has, as yet, taken no steps toward the encouragement of industry in this direction.



MECHANISMS

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Interrupted Rotating Motion with Quick Take-Up Action

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By L. KASPER

The design of what might be called an interrupted rotating motion mechanism with quick take-up action is illustrated by the accompanying diagrams, Figs. 1 to 3. The purpose of this mechanism is to transmit motion to gear C from shaft A

in such a manner as to have the rotary motion of gear C temporarily interrupted for a short, definite period followed by a quick take-up rotary motion which recovers the motion lost during the idle or interrupted period. This mechanism is incorporated in a machine that produces a woven-wire fabric. The object is to obtain a time delay in the motion of one part while another part is completing a portion of its cycle, the first part then increasing its rotative speed so that at the comple-

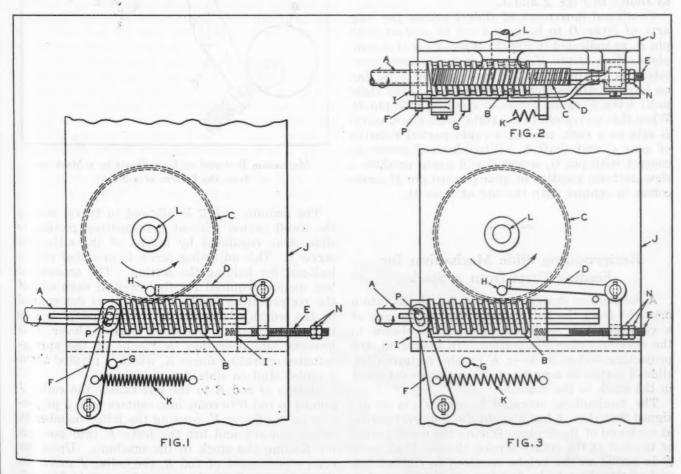


Fig. 1. Interrupted Motion Mechanism with Members in Position for Driven Gear C and Shaft L to Begin Idle or Dwell Period while the Driving Shaft A Continues to Rotate. Figs. 2 and 3. Plan and Top Views of Mechanism at Point in Cycle in which Dwell Period of Gear C is Ended by the Raising of Lever D Out of Contact with the Stop-pin H through Contact of Nuts N with the Short End of Bellcrank D

tion of the cycle the parts will have regained their

original relative positions.

Fig. 1 represents the mechanism at the point in the cycle at which the interruption occurs. The driving shaft A, rotating in the direction indicated by the arrow, carries the worm B, which is prevented from turning on the shaft by a spline. The slide I, mounted on part J, serves as a support for shaft A. Slide I carries a pin P which passes through the slotted end of lever F. Lever F is held against the stop-pin G by the spring K. Slide I also carries the stud E which passes through the slotted arm of bellcrank lever D. Worm-gear C meshes with and receives its motion from worm B and transmits motion to shaft E in the direction indicated by the arrow. Gear E carries the pin E which contacts the end of lever E.

Fig. 1 shows the mechanism with gear C at the point where pin H has come into contact with lever D, which prevents further rotation of gear C. As continued rotation of shaft A and worm B can no longer transmit motion to gear C, the rotation of worm B causes it to act as a screw and to move to the left on shaft A, carrying slide I with it. As slide I moves to the left, lever F is moved out of contact with pin G against the resistance of spring K. This motion continues until the lock-nuts N on stud E come in contact with the end of lever D,

as shown in Figs. 2 and 3.

Continued movement of slide I causes the long arm of lever D to be raised out of contact with pin H, as indicated in Fig. 3. When lever D is completely free of pin H, gear C is again free to rotate. At this point in the cycle, spring K, acting on lever F, draws slide I and worm B to the right until lever F again comes in contact with pin G. When this movement to the right takes place, worm B acts as a rack, causing a rapid partial rotation of gear C and shaft L. When lever F comes in contact with pin G, worm B will again produce a slow uniform rotation of gear C until pin H again comes in contact with the end of lever D.

Reciprocating Slide Mechanism for Feeding Parts from a Stack

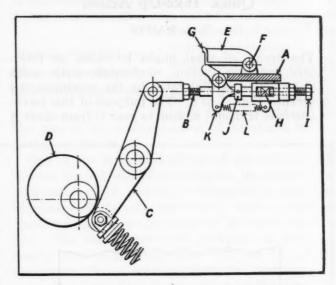
A mechanism designed to feed flat sheets into a machine from the bottom of a stack by means of a cam-operated reciprocating slide is shown in the accompanying illustration. In operation, the projecting end G of lever E on the reciprocating slide A serves as a pusher to feed the lowest sheet in the stack to the machine.

The mechanism, operated by cam D, is so designed that slide A has a slight dwell or rest period at each end of its stroke. During the dwell period at the end of the return stroke, the end G of lever E is raised to the height required to contact the end of the sheet to be fed from the stack, and is then moved forward to the left, carrying the sheet into the machine. During the dwell period of slide A at the end of the feeding stroke, the pusher

end G of lever E drops down so that it clears the stacked sheets during the return stroke of slide A.

Referring to the construction and operation of the mechanism, the main slide A is reciprocated by means of the adjustable rod B, which in turn is linked to the oscillating arm C. This oscillating arm receives its motion through the operating cam D and a cam roller kept in contact with the cam by means of a compression spring. The lever E, carried by slide A, is pivoted about the center F, as required to enable its projecting end G to serve as the pusher for feeding the sheets into the machine.

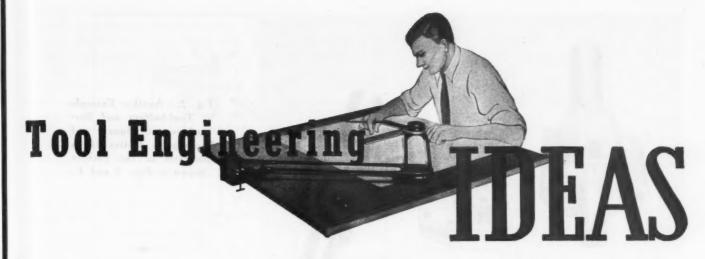
The right-hand end of adjustable rod B has an enlarged portion in which a slot is cut. The under side of slide A has a lug that serves as an anchor for the tension spring L. This lug is also provided with a square-ended stud H, machined to a sliding fit in the slot in the enlarged end of rod B.



Mechanism Designed to Feed Sheets to a Machine from the Bottom of a Stack

The amount rod B is allowed to travel during the dwell period without transmitting motion to slide A is regulated by means of the adjusting screw I. This adjusting screw is provided with a lock-nut for holding the setting. The amount of lost motion required for the dwell at each end of the reciprocating stroke of slide A is determined by the length of the slot in which stud H is free to travel. During the dwell periods, lever E is brought into operation by means of the spring-actuated operating finger K, which is pivoted about a center stud on slide A.

Motion of rod B to the left causes the collar J pinned to rod B to come into contact with a projection on the finger K, causing the latter member to swing upward and lift the lever E into position for feeding the stock to the machine. Upon the return movement of rod B, the collar J moves to the right and allows the spring L to rotate finger K counter-clockwise, so that the pusher point G at the end of lever E is lowered out of contact with the work during the return stroke.



Broaching Holes through Boring-Bars and Tool-Holders

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By I. F. YEOMAN, Elkhart, Ind.

Prior to the war, it was common practice to drill holes in tool-holders and then machine the holes square on a shaper or slotter. This method often required several hours to finish a single hole. The necessity for greater production of the tool-holders due to war demands made a faster method of finishing the holes imperative. The universal fixture described in this article was developed for expediting this operation.

Several boring-bars used on the Foster Fastermatic that have had holes for the cutters broached by the use of this fixture are illustrated in Figs. 1 and 2. The fixture was designed for use with a 25-ton horizontal broaching machine manufactured by the Lapointe Machine Tool Co., and is shown mounted on one of these machines in Fig. 3. However, with modifications this type of fixture would be suitable for use with vertical broaching machines and other horizontal broaching machines.

The fixture, as indicated in Fig. 4, consists basically of a cradle A, faceplate B, plate C, and knee D. The clamps E and F secure the fixture in the adjusted position. The pins G and H locate the fixture in the "zero" or starting position. The pilot J, which is an integral part of the cradle, fits snugly in the bore in the end of the broaching machine. The opposite end of the cradle forms an arc which is machined to receive the mating surface of the faceplate B. A 30-degree face M is machined in the cradle to dovetail with and support the 30-degree surface on the faceplate. clamps E, which are secured to the cradle by dowel-pins and bolts, also have a 30-degree surface K to retain the faceplate. Flange L, which is an integral part of the cradle, may be locked to plate C by means of clamps F. Plate C secures the entire fixture to the broaching machine. The knee D is bolted to the faceplate B, and is adjustable up or down by means of T-slots provided on the surface of the faceplate.

The work to be broached may be clamped in V-blocks or bolted directly to the knee or faceplate of the fixture. A ground guide rod M, shown in

Fig. 1. Boring-bars with Cutter Holes Broached by the Use of the Fixture Shown in Figs. 3 and 4



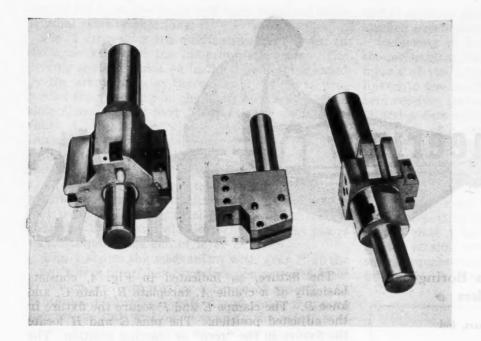


Fig. 2. Another Example of Tool-holders and Boring-bars with Square and Rectangular Cutter Holes Broached in the Fixture Shown in Figs. 3 and 4

Fig. 5, is used to align the hole in the work with the broach. The guide rod is ground 0.002 inch smaller than the diameter of the hole reamed in the work. After clamping, the guide rod should slide freely through the work and into the center of the broaching machine ram.

Starting holes should have a diameter slightly larger than the width of the square to be broached. Holes from 3/8 to 3/4 inch square should have a starting hole with a diameter 1/32 inch larger than the width of the square; and holes from 3/4 inch to 1 1/8 inches square should have starting holes 1/16 inch larger than the width of the square. On holes less than 3/4 inch square, two broaches are generally used to finish each size. Holes from 3/4 inch to 1 1/8 inches square usually require three broaches to finish each size.

Rectangular holes can be finished with square broaches by using the liner N shown in Fig. 6. The inner surface of the liner is machined to correspond with the taper of the broach. Several liners may have to be used, depending upon how much the hole is being widened.

In dire need of rolling stock with which to revitalize its economy, France has turned to American enterprise and ingenuity to put its railroads back in operation as rapidly as possible. The first step toward this end has been the placing of an order with the American Car & Foundry Co. for 8750 box cars and 4000 gondola cars. The box cars are of four-wheel design and weigh 20 tons.

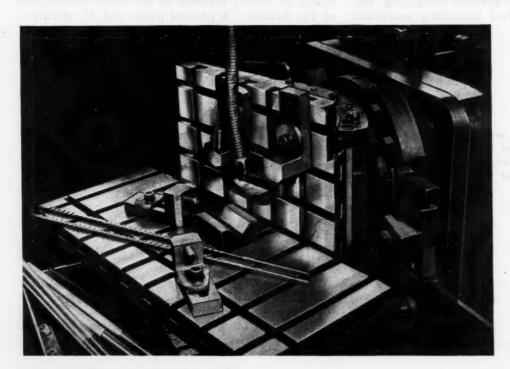


Fig. 3. Universal Fixture
Mounted on a Horizontal Broaching Machine. Details of This
Fixture are Shown in
Fig. 4

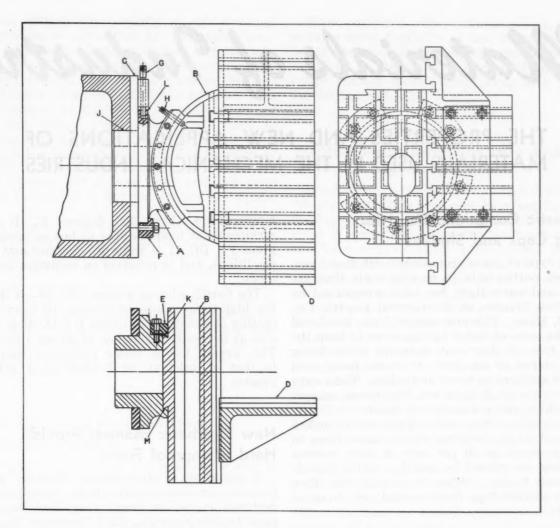
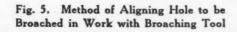


Fig. 4. Details of Universal Fixture for Broaching Cutter Holes in Boring-bars and Tool-holders



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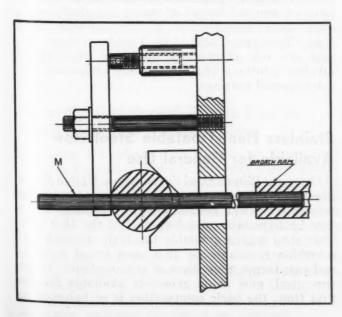
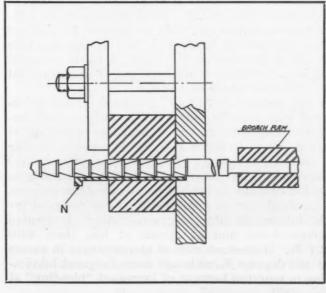


Fig. 6. Liner Permits Finishing Rectangular Holes with a Square Broach



Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

G-E Plastic Compound Used for Sealing Caps and Sleeves

A new type of plastic compound with many possible uses, particularly in making seals that are air-tight and water-tight, has been brought out by the Plastics Division of the General Electric Co., Pittsfield, Mass. This new material was developed to seal the ends of metal tubing so as to keep the interior free of dust and moisture while being shipped, stored, or handled. It is also being used for sleeve markers on wires and cables. These caps and sleeves are available in red, blue, green, orange, yellow, white, and a transparent finish.

Silicone Greases for High- and Low-Temperature Bearing Lubrication

Four silicone greases have been developed by the Dow-Corning Corporation, Midland, Mich., to meet the need for high- and low-temperature bearing lubrication. The first of these—DC 31—is an almost completely inorganic grease designed for low-temperature lubrication at operating speeds of less than 4000 R.P.M. It is serviceable at temperatures as low as minus 95 degrees F., and yet has satisfactory lubricating life at temperatures of 200 to 300 degrees F. DC 31 is water-resistant under any service conditions, and is also resistant to oxidation by air or ozone.

The second—DC 33—is a silicone grease thickened with metallic soaps, and is designed for lowtemperature lubrication of bearings operating at speeds up to 10,000 R.P.M. It is serviceable over a temperature range of minus 95 degrees to 300 degrees F. Its water resistance is comparable to that of calcium- or lithium-based petroleum greases.

A third silicone grease—DC 41—is designed for the lubrication of bearings operating at elevated temperatures and at speeds of less than 4000 R.P.M. It does not melt at temperatures in excess of 480 degrees F., although more frequent lubrication is required because of increased "bleeding" at

temperatures above 300 degrees F. It is also serviceable at temperatures as low as minus 4 degrees F. DC 41 is waterproof under any service conditions, and is resistant to oxidation by air or ozone.

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New Synthetic Enamels Provide Hard Stainproof Finish

A new group of all-synthetic, "Hi-bake" enamels that give an exceptionally hard, stainproof finish designed to endure heavy usage has been developed by the Arco Co., 7301 Bessemer St., Cleveland, Ohio. These finishes, called "Synox," are already being produced in several whites which have been thoroughly tested and adopted by a number of household appliance manufacturers. One type is designed for refrigerators, stoves, ironers, and electric mixers, and another for dishwashers and washing machines.

Stainless Heat-Treatable Steel Now Available for General Use

Carnegie-Illinois Steel Corporation, United States Steel Corporation subsidiary, has announced the release from war restrictions of "Stainless W," a new heat-treatable stainless steel of the 18-8 type. This steel makes available the high strength and corrosion resistance of 18-8 steel in all wrought and cast forms, regardless of size or shape. In the new steel, now made generally available for the first time, the basic composition is so balanced as

to insure, without the necessity of cold-working, the approximate completion of the austenite-to-ferrite (martensite) transformation and the subsequent process of precipitation hardening.

In the annealed condition, "Stainless W" ordinarily has a hardness of 22 to 28 Rockwell C, a tensile strength of 120,000 to 150,000 pounds per square inch, and a yield strength of 75,000 to 115,000 pounds per square inch. By proper heattreatment, the hardness can be raised to 39 to 47 Rockwell C, the tensile strength to 195,000 to 225,000 pounds per square inch, and the yield strength to 180,000 to 210,000 pounds per square inch.

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A Soft Soldering Flux that Leaves No Harmful Residues

An organic soft soldering flux, which is said to be more effective than common rosin fluxes and does not normally leave a corrosive residue on the work, has been announced by the Superior Flux Co., Public Square Bldg., Cleveland 13, Ohio. The composition of this flux, known as "Superior No. 30 Supersafe" soft solder liquid flux, was developed by the Battelle Memorial Institute in an investigation sponsored by the Tin Research Institute.

The new flux is not offered as a general substitute for the commonly used zinc-chloride fluxes, but is recommended particularly for applications where rosin-alcohol is unsatisfactory or where zinc-chloride or similar strong acid fluxes cannot be used because of the corrosion factor. It can be used in soldering copper, steel, silver, brass, various alloys, and electroplated parts, such as nickel plate, silver plate, and cadmium plate.....205

Recently Developed Plastic that is Flexible at Low Temperatures

Among the plastics on display at the recent Plastics Exhibit in Philadelphia was a new plastic known as Styraloy. This plastic, developed by the Dow Chemical Co., Midland, Mich., for secret military uses and for cable sheathing, has properties that place it in the field between the rigid plastics and rubber. It is the lightest in weight of all Dow plastics, and will float on water. Its flexibility at low temperatures is one of its outstanding characteristics.

Westinghouse Develops New Process for Producing Molybdenum

Limitations in the production of molybdenum in "chunks" of large size and in a multiplicity of molded shapes have been removed by the development of a new process at the Westinghouse Electric Corporation's plant in Bloomfield, N. J., devoted to lamp and electronic tube manufacture.

Because molybdenum melts at a temperature well above that of other common metals (4748 degrees F., as compared with 2800 degrees F. for iron, and 1976 degrees F. for copper), it cannot be melted to form large solid pieces, because any container or crucible of the commonly used materials would melt first. In the past, molybdenum pieces have been made by compacting molybdenum powder into the desired shape under great pressure and then passing a high current through the piece to bring its temperature just up to the melting point, so that the particles rigidly adhere to one another. This method has obvious limitations both as to the size and shape of pieces obtainable.

Using the new process developed by Westinghouse, molybdenum pieces can be produced in any shape that can be molded. They can be round or square, with fins, angles, or holes, and of much larger size than has heretofore been possible.

Molybdenum is now being used in the form of crucibles, electronic tube parts, electrical contacts, electrodes for resistance heating, thermocouple tubes, and electric furnace heating elements for high-temperature work in a vacuum or protective atmosphere. It is expected to be useful for welding alloys and high-temperature engine parts. 207



New Process of Making Molybdenum Enables Pieces of Any Size or Shape that can be Molded to be Produced

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Imp Lo-Swing Automatic Lathe with Rotary Loader and Double-End Drive

a Lo-Swing Imp lathe which is en-spindles is by pulleys and V-belts tirely automatic in operation and is from a splined jack-shaft extending

Seneca Falls, N. Y., has brought out similar jobs. The drive to both equipped with double-end drive, work along the rear of the machine. Two chute, and rotary loader. This new advantages are claimed for the machine is shown in Fig. 1 tooled up double-end drive when handling work for turning valve guides, but it is of this type: First, driving the piece

The Seneca Falls Machine Co., adapted for handling a variety of from both ends permits much coarser carriage feeds to be used, which results in increased production; and, second, the driving of both spindles practically eliminates wear on the work-supporting centers, since they revolve with the piece being machined.

In machining valve guides on the lathe illustrated, the work, which has previously been bored to size, is placed in the loading chute and fed by gravity into openings in the rotary loader. The loader indexes the pieces to the proper position, where they are automatically picked up by the continuously revolving spindles of both heads. The slots in the rotary loader are slightly larger than the rough parts and provide sufficient clearance to allow the work to revolve while it is held between centers, as shown in Fig. 2.

The work is turned to the required outside diameter with one or two tools mounted on the front slide. The piece is automatically ejected at the end of the cut, and both spindles are backed off to release the finishturned piece, which remains in the loader until indexed into the unloading chute. The rotary type loader assures complete control over the fast revolving pieces, eliminating danger to the operator and damage to the parts. The pieces cease to rotate before they reach the discharge chute.

Parts can be turned to size with a single carbide tool or they can be rough- and finish-turned in the same operation with two separate carbide tools arranged as shown in Fig. 2. In this case, the carriage cam has two separate feeding angles with a ratio of 2 to 1. The part is generally rough-turned with a feed of 0.030 inch per revolution of the spindle,

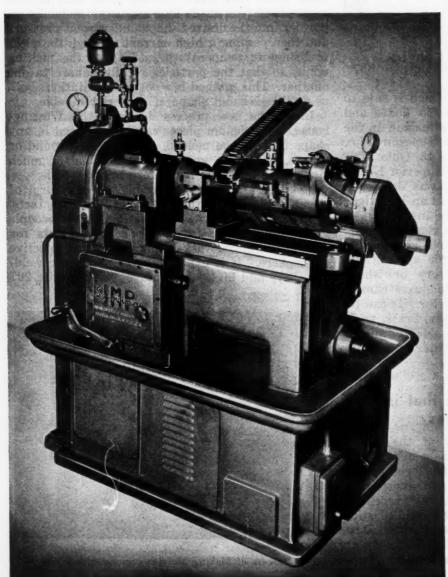


Fig. 1. Imp Lo-Swing Automatic Lathe Brought out by the Seneca Falls Machine Co.

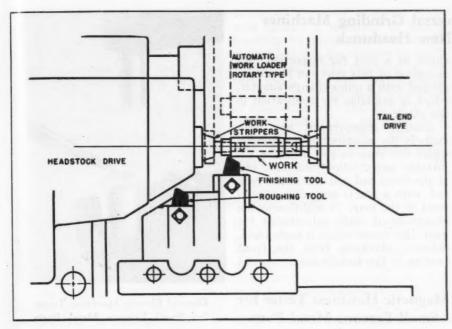


Fig. 2. Tool Layout for Machining Valve Guides on Imp Automatic Lathe Shown in Fig. 1

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and a feed of 0.015 inch is usually tool has cleared the work and assures employed for the finish-turning close concentricity between the bore operation. The finish-turning tool and outside diameter of the finished

Cleveland Power-Driven Metal-Cutting Shears

the Cleveland Crane & Engineering feature is included on all machines Co., Wickliffe, Ohio, is introducing at with standard 24-inch depth of the National Metal Show in Cleveland throat, but is not furnished on the a line of power-driven metal-cutting small 18-inch throat shears. shears that are radically different in These new machines, known as Cleveland Steelweld shears, operate on a pivoted-blade principle which is said to result in several outstanding advantages. For example, there are no slides or guides to wear out of true and cause inaccuracies. The upper blade operates on two heavy pivot pins secured to the end housing, and travels in a circular path.

One important feature of these shears is the ease with which the knife clearance can be varied to suit the thickness of the plate being cut. This is done by merely turning a hand-crank at the right-hand end of the machine housing. A large dial indicator shows the clearance or gap between the knives in thousandths of an inch and also indicates the plate thickness that can be cut.

The shears can be readily arranged for squaring or slitting, or they can be set and firmly locked at any inter-

The Heavy Machinery Division of mediate position for notching. This

Other features include heavy design from any previously available. spring-operated mechanical holddowns which secure the plates firmly

during shearing and automatically clamp thick plates with increased pressure. The back gage is mounted on ball bearings to provide easy operation. These shears have been developed in various sizes for cutting plates of all thicknesses from 12 gage up to 1 1/4 inches, and in lengths from 6 to 16 feet. Speeds range from 60 strokes per minute on the smaller shears to 25 strokes per minute on the largest size. The Model No. 610 machine illustrated will cut plates up to 3/4 inch thick by 10 feet wide._52

"Gibsiloy" Electrical Contacts

A new series of "Gibsiloy" electrical contacts made from silver tungsten and silver tungsten carbide has just been placed on the market by the Gibson Electric Co., 8362 Frankstown Ave., Pittsburgh 21, Pa. The contacts made from these new materials were developed to meet war demands and are now available in a wide variety of shapes.

Important characteristics of these electrical contacts include higher current-carrying capacity, greater resistance to welding, and longer life. These properties enable the designer to utilize higher current densities with increased efficiency in performance and lower construction costs. On an air circuit-breaker, for example, a contact with less than 1/6 square inch of contact area will repeatedly break circuits of 15,000 amperes at 600 volts without sticking, welding, or excessive wear.....53



Cleveland Steelweld Power-driven Metal-cutting Shears

Cincinnati Hydraulic Universal Grinding Machines Equipped with New Headstock

A new headstock incorporating noteworthy improvements has recently been applied to the line of hydraulic universal grinding machines built by Cincinnati Grinders Incorporated, Cincinnati 9, Ohio. The major feature of interest in this new headstock is the modified lathe standard spindle nose, which permits standard chucks and faceplates to be mounted on the spindle without using intermediate adapters.

The dimensions conform substantially to American standards (the headstock of the 12-inch grinder having a 5-inch lathe standard spindle nose, while the headstocks of the 14-, 16- and 18-inch machines have 6-inch lathe standard spindle noses), with the exception that the number of threaded holes for mounting chucks and faceplates has been reduced to four and the taper has been made slightly smaller to assure positive "squaring up" of the chuck or faceplate against the spindle flange. The spindle nose and a faceplate ready for mounting are shown in Fig. 1, while the headstock unit with a chuck mounted in position is illustrated in Fig. 2.

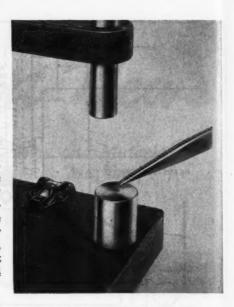
The majority of live-spindle work can be handled on these machines with a chuck or faceplate mounted directly on the spindle nose. However, if desirable, provision can be made for removing the work and

chuck as a unit for inspection. An operation of this type can be accomplished with a quick-change adapter, which is available for application to the chuck.

Another improvement has been made in the mounting of the spindle, which now runs on two precision adjustable anti-friction bearings, one at the front end and one at the rear end, with a single accessible adjustment at the rear. In addition to the advantage of easier adjustment for wear, this construction is more rigid, reducing overhang from the front bearing to the spindle nose. 54

Magnetic Hardness Tester for Small Ferrous Metal Parts

The General Electric Co., Schenectady 5, N. Y., has announced the development of a magnetic hardness tester by its Meter and Instrument Division, West Lynn, Mass. This new tester has been designed for the rapid, accurate gaging of the hardness of small ferrous metal parts. It serves as a "Go" and "No Go" hardness gage, and thus simplifies inspection of such parts as electrical instrument pivots and shafts, watch shafts, small steel balls, and other parts that are too small to be production-tested with mechanical type hardness testers. It also permits the



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General Electric Hardness Tester for Small Ferrous Metal Parts

spot-checking of hardness in large sheets or in lengths of steel wire through the comparison of randomselected small samples.

The tester is 6 inches long, 3 1/2 inches wide, and 7 inches high. It consists of an Alnico bar magnet set in an adjustable soft iron frame which permits the air gap, and thereby the field strength, to be set at the correct value for testing pieces of different sizes whose dimensions range from 1/16 to 1/2 inch. A knurled thumb-screw serves to lock the air-gap adjustment, and

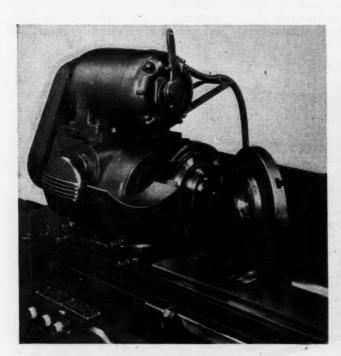


Fig. 1. New Headstock of Cincinnati Grinder with Modified Lathe Spindle Nose Designed to Take Standard Faceplates and Chucks

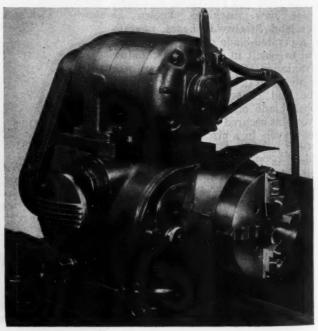


Fig. 2. Improved Headstock of Cincinnati Grinder with Standard Lathe Chuck Mounted on the Modified Spindle Nose

specimens is mounted on the base of ness against a specimen of known the tester, a little out of the direct line of the magnetic field. A twoway level is attached to the base to show when the tester is properly positioned, and a pair of brass tweezers is furnished for handling the specimens.

Operation of the tester is based upon the correlation of hardness and coercive force in magnetic materials.

a brass block for positioning the It checks pieces of unknown hardhardness by comparing in a simple mechanical test the relative strength of the magnetism produced in the test pieces and in the standard specimen under the same conditions of magnetization. This test will distinguish differences as little as 2 points on the Rockwell C scale, and does not damage the piece being tested.

Reed Plate-Bending Rolls

out a new line of plate-bending rolls in four models, known as Series 400, with working-length capacities ranging from 38 to 74 inches. The smallest model, with a capacity for bending 10- to 12-gage plates in lengths up to 38 inches, is 22 by 66 inches over all, has a roll diameter of 4 1/4 inches, a rolling speed of 18 feet per minute, and a shipping weight of 1500 pounds. The largest model will bend 16- to 18-gage plates in lengths up to 74 inches, is 22 by 102 inches, has a roll diameter of 4 1/4 inches, a rolling speed of 18 feet per minute, and weighs 2250 pounds. All four models are equipped with 1-H.P. motors, but other sizes can be furnished on special order.

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These machines were designed primarily to meet the demand for

The Reed Engineering Co., P. O. inexpensive, soundly built, small Box 111, Webb City, Mo., has brought plate-bending rolls. They are conservatively rated in all sizes. Each unit is of all-steel welded construction. All four models are provided with large handwheels and thrust bearings designed for rapid adjustment. Gear reduction is obtained through totally enclosed worm-gear drives.

> Standard equipment includes rearroll position indicator for duplicate rolling, and retarding attachment for the rolling of conical shapes. These machines are of the drop-end type, the top roll being automatically raised when the tail hinge of the machine is lowered for the removal of plates that have been rolled into complete cylindrical forms. All bearings are bronze-bushed, and provision is made for the use of pressure lubrication.

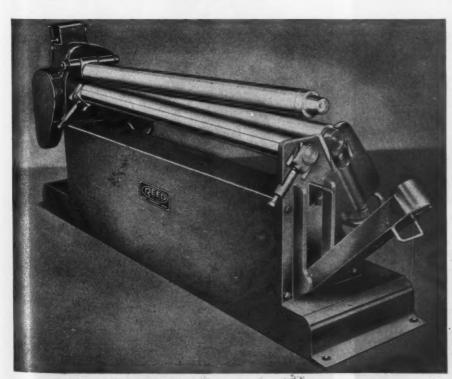
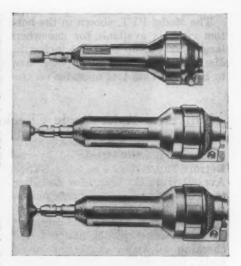


Plate-bending Roll Brought out in Four Sizes by the Reed Engineering Co.



New Series of "Featherweight" Grinders Built by the Madison-Kipp Corporation

Kipp "Featherweight" Series of Portable Air Grinders

The Madison-Kipp Corporation, 203 Waubesa St., Madison 4, Wis., has just brought out two new grinders (Models TT and PVT), which completes the series of three Featherweight models shown in the accompanying illustration. The extremely light weight of this series of Kipp air grinders, including the previously announced JA model, is obtained by the use of aluminum and magnesium for such parts as housings, backplates, rotors, and lock-nuts. Other new features of these tools include lower air consumption, larger spindles, more stable operation, and parts made to a higher degree of accuracy and balance. The speed is regulated by an exhaust type governor, which not only holds a predetermined rate of speed, but also assures an insignificant drop in speed when the grinders are applied to the work.

The Model JA grinder, shown in the top view of the illustration, is a turbine type tool which takes wheels up to 7/8 inch in diameter and has a speed of 50,000 R.P.M. The collet size for this model is 1/8 inch, and the weight of the tool is 12 ounces. The over-all length is

6 3/4 inches.

The Model TT grinder, shown in the center view, is also a turbine type tool; it takes wheels up to 1 1/4 inches in diameter. This grinder has a speed of 30,000 R.P.M. and a collet size of 15/64 inch. The weight is 2 pounds, and the over-all length 9 inches.

The Model PVT, shown in the bot- vane type principle instead of by simple table supplied with the matom view, is available for use when turbine, and its standard speed is larger wheels, up to 2 1/2 inches in 10,000 R.P.M. It has a collet size diameter, requiring more power are of 1/4 inch, a weight of 2 pounds 4 to be used. This tool operates on the ounces, and a length of 9 inches. 57

chine quickly converts this reading, if desired, to the corresponding rake angle for the diameter of the tool being checked. The checking of flute spacing is just as easily accomplished.

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Simple interchangeable master index-plates are available for testing cutters having odd numbers of flutes or gashes. To check the flute spacing, the built-in indicator is first set to zero with the contact point against one flute face. The tool is indexed from flute to flute, the accuracy of the spacing then being shown by the

Universal Rake-Angle Checker for Form-Relieved Tools

checker originally developed by the Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 11, Mich., for checking tooth spacing and hook or rake angles on thread milling cutters is now being manufactured by this company in a universal model adapted for checking all types of form-relieved tools. With this new device, relieved forming tools can be checked for accuracy after sharpening without the use of gage-blocks, surface plates, V-blocks, indicator stands, or similar accessories commonly employed for checking tools of different sizes and types in setting up. It is particularly well adapted for use in both large centralized tool-grinder departments and in small shops.

The checker is of the visual alignment type. Circular form tools, thread buttons, gear-cutters, hobs, reamers, and form-relieved milling cutters can be checked by simply placing the cutter or tool between

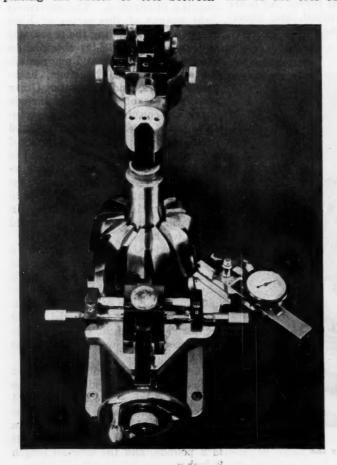
The plain rake or "hook" angle the adjustable centers and bringing the ground knife-edge against the cutting face of the tool until no light is perceptible between the two. The exact offset distance of the cutting face from the center line of the tool is then indicated on an integral micrometer barrel. Reference to a indicator readings.

Hager Carbide-Tool Grinder

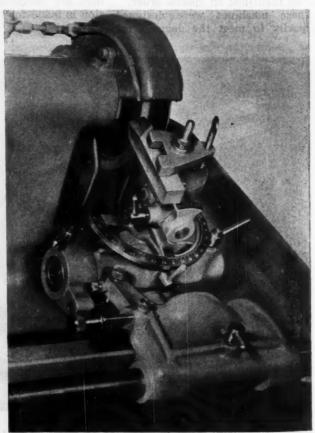
A new carbide-tool grinder introduced on the market by E. F. Hager & Son, 98-02 217th Lane, Queens Village 9, N. Y., has incorporated in its design a reciprocating action which serves to eliminate free-hand operation and insure grinding tool surfaces to the correct angles. The built-in reciprocating motion unit consists of a tool-holder protractor arrangement which pivots on a fixed center. This arrangement prevents any floating action. The positive control of the tool obtained with this

equipment permits the grinding operation to be speeded up and assures grinding the surfaces to exact angles with a fine finish, even when the grinding is done by unskilled operators.

The grinder will accommodate carbide tools in sizes up to and including 1 1/2 inches square. Carbide tools for lathes and automatic screw machines, and milling cutters, offset tools, spiral reamers, counterbores, and other types of carbide-tipped tools within the range of the ma-



Universal Rake-angle Checker for Form-relieved Tools



Carbide-tool Grinder Brought out by E. F. Hager & Son

chine can be easily ground. A wide range of attachments is available for these and other types of carbidetipped tools.

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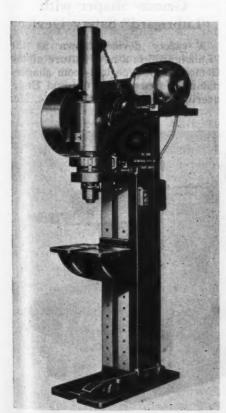
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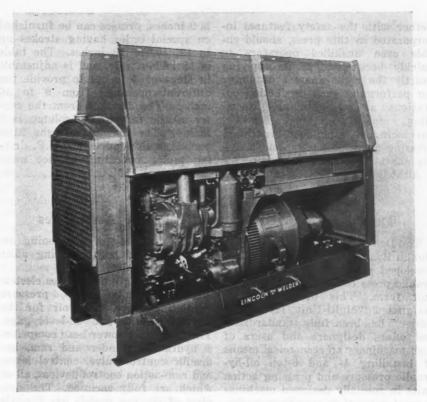
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By mechanically maintaining the tool in constant motion, localized overheating is avoided, the carbide tip is prevented from splitting, and wear on the diamond grinding wheels is reduced. Once the tool has been clamped in the desired position in the holder and set by the protractors for the required cutting and clearance angles, the uniform reciprocating motion of the tool across the rough-grinding diamond wheel results in a keen, durable cutting edge and a straight face. The vise-like tool-holder can be easily slid from the rough-grinding wheel to the finish-grinding wheel without removing the tool or changing the angular settings. This arrangement makes possible very accurate finishgrinding.

Parallel sides are easily obtained, and duplicate tools can be precisely ground for interchangeable use. It is claimed that the lapped-finish edges produced by this machine will outlast those of hand-ground tools. An ample flow of coolant from a centrifugal pump can be directed by means of a flexible tube to the point where it is most needed to prevent overheating of the tool. _59



Flexible-power Press of Improved Design Built by General Mfg. Co.



Lincoln Diesel-engine Driven 300-ampere "Shield-Arc" Welder

Lincoln Welder with Diesel Engine Drive

A new welder of 300-ampere capacity, equipped with a Diesel engine for use in locations where electric power is not available or not economical, has been placed on the market by the Lincoln Electric Co., Cleveland 1, Ohio. The two-cycle Diesel engine used to drive this Shield-Arc welder is said to make possible exceptionally large savings in fuel costs. In many cases, total savings, including transportation of fuel, fuel losses, etc., are said to be as high as 40 cents per hour.

The dual continuous control of this welder permits the selection of any type arc and any arc intensity required for the job. This feature has been developed to improve the quality

of the weld, increase the welding speed, and make the welding job easier for the operator. Its fine adjustment also makes it possible to handle a wider range of work as regards thickness of the material and class of metals and alloys welded. The welding generator has an NEMA rating of 30 amperes at 40 volts. The current range of welding duty is from 20 to 40 volts, 60 to 375 am-

The stationary model weighs 2560 pounds, and can be readily mounted on wheels, trailer, or truck. Optional equipment includes spring-mounted running gear of the automobile trailer type with four pneumatic tire wheels. _

Flexible-Power Mechanical Press

work requiring the application of ram strokes up to 9 inches in length and pressures up to 15 tons has been brought out by the General Mfg. Co., Detroit 11, Mich. This press-the No. 106-applies power to the ram through a driving worm, worm-gear, and spline keys in such a manner that the pressure exerted on the work by the ram is propor-

A flexible-power press designed tional to the amount of pressure for fast, easy, and safe operation in applied to the foot-pedal. With this handling a wide range of pressing arrangement, the length of each individual ram stroke, as well as the pressure applied to the work, can be controlled by the foot-pedal, which leaves both of the operators hands free for handling the work. The ram can be stopped at any point on its downward stroke and returned to the starting point by simply releasing the foot-pedal.

The instant, flexible control, to-

corporated in this press, should enable even unskilled operators to quickly become adept in applying exactly the right amount of power for performing such production operations as straightening, assembling, staking, forcing, bending, burnishing, riveting, push-broaching, pressing gears on shafts, and pressing shafts into armature cores.

Although the standard ram stroke

gether with the safety features in- is 9 inches, presses can be furnished on special order having strokes up to 12, 15, or 18 inches. The table is 18 inches wide, and is adjustable in steps of 3 inches to provide ten different openings from 9 to 36 inches. The distance from the center of the ram to the column is 9 inches. The machine weighs 2100 pounds, and requires a 5-H.P. driving motor operating at not more than 1200 R.P.M.

Denison Packaged Hydraulic Power Assemblies

The Denison Engineering Co., 1160 Dublin Road, Columbus 16, Ohio, has developed a group of packaged hydraulic press components in compact unit form. This new equipment, designated "Multi-Unit HydrOILic Power," has been fully standardized, and offers designers and users of such machinery an economical means of installing 4- and 6-ton oil-hydraulic pressure and pressing action units in specially designed machines to meet unusual or specific manufacturing requirements.

The individual "packaged" multiunit press components include compact and easily moved pumping units in two models, one of which is shown at the left, Fig. 1, and five models of power heads, one of which is illustrated at the right in Fig. 1. All units are designed for mounting on frames or bases in positions where their pressing actions can be used to best advantage. When desired, they can also be mounted on a standard multi-unit frame, as shown in Fig. 2. Standard frames are available that

permit a variety of positioning arrangements of both pumping units and power heads.

The pumping unit includes electric motor, hydraulic pump, pressure regulating valve, reservoir for the hydraulic fluid, and oil-level gage. The multi-unit power head comprises a hydraulic cylinder and ram, hydraulic control valve, control lever, and ram-action control devices, all of which are fully enclosed. The simplest of the five models has throttle type control of the ram movement and speed by means of a hand-lever. The second model offers rapid ram traverse and adjustable approach speed, while the third model features automatically repeated short, uniform-pressure strokes of the ram on the work as long as the control lever is held in the operating position. The fourth model provides automatic ram cycling-either single cycle or continuous cycle-in addition to holddown or dwell action. The fifth model combines practically all the features of the other models and carries the

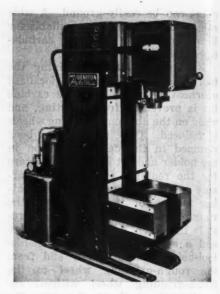


Fig. 2. Self-contained Hydraulic Press Consisting of Denison "Packaged" Units Assembled on Frame

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vibratory HydrOILic pressure feature through which short, automatically repeated, uniform-pressure strokes are applied to the work in perfectly timed sequence at frequencies which can be adjusted from a few strokes per second to a rapid vibrating frequency.

Gemco Shaper with "Lubrigard" Safety Device

A safety device known as the "Lubrigard" is a new feature of the Gemco crank type tool-room shapers manufactured by the General Engineering & Mfg. Co., St. Louis 4, Mo.

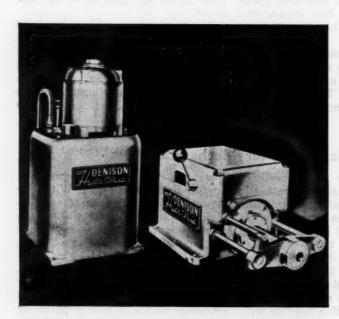


Fig. 1. Denison "Packaged" Hydraulic Pumping and Power-head Units

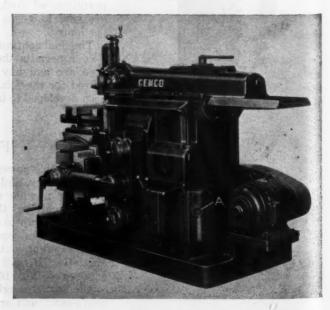


Fig. 1. Gemco Shaper Equipped with "Lubrigard" Safety Device

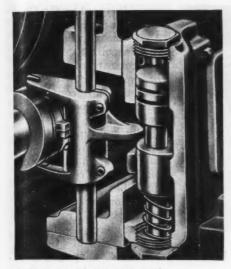


Fig. 2. "Lubrigard" Safety Device which is Built into the Base of New Gemco Shapers

This safety device, consisting essentially of the mechanism shown in Fig. 2, is built into the shaper at A, Fig. 1. It is designed to automatically prevent the ram of the shaper from being started if the oil supply in the reservoir is insufficient, the oil pressure is inadequate, a leak or failure in the oil pressure system occurs, the filter becomes clogged, or the drive pulley rotation is incorrect.

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The device also prevents the clutch control lever from being engaged while the drive pulley is at rest, and therefore prevents injury to the operator or damage to the machine from unexpected movement of the ram in case the motor is started either accidentally or intentionally.

By reference to Fig. 2 it will be clear that the oil under pressure serves to force the piston down, so that the projection on the clutch control lever shaft will clear the recess in the piston and thus allow the control lever to be moved into the starting position.

Lidkoping Centerless Grinder

The Triplex Machine Tool Corporation, 125 Barclay St., New York 7, N. Y., agent in this country for the centerless grinders manufactured by Lidkoping Mekaniska Verkstads A.B., Sweden, a division of S K F Industries, Inc., is demonstrating a No. 3A Lidkoping centerless grinder at the Metal Show in Cleveland. One of the operations performed in demonstrating this machine consists of grinding three diameters, a 30-degree tapered seat, and a straight shoulder on an air-

plane-engine valve guide in a single operation which holds the work to size within a total tolerance of 0.0008 inch. These machines can be used for in-feed or plunge-cut, as well as for through-feed grinding.

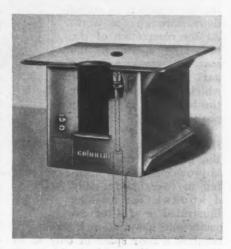
Both wheels of these machines are provided with means for adjustment relative to the work. A wide variety of attachments is available for profile grinding, feeding of short pieces, and grinding of bars and tubes, twist drills, etc. The rating of the grinding spindle driving motor on the No. 3A machine is 15 H.P.; on the No. 4A, 25 H.P.; on the No. 5A, 50 H.P.; and on the No. 6A, 90 H.P.

The grinding wheels used on these machines range in size from 16 inches in diameter by 6 3/4 inches in width up to 30 inches in diameter by 16 inches in width. The No. 6A centerless bar-stock grinder, which is claimed to be one of the largest machines of its kind, is now being used in a number of British, Swedish, and other continental steel mills for grinding shafts up to 6 inches in diameter by 25 feet in length. 64

Colonial Flat-Top Broaching Machines

The Colonial Broach Co., Detroit 13, Mich., has announced a radically new type of equipment designated the "Flat-Top" utility pull-down broaching machine. This new machine has a horizontal platen on which large, bulky parts can be manually positioned for the broaching operation.

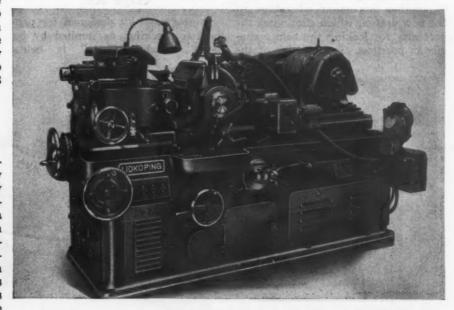
This machine is not intended for high-production work, although automatic broaching pullers are available. It is designed primarily for handling large work where the



"Flat-Top" Broaching Machine Made by the Colonial Broach Co.

volume does not justify the construction of special work-holding fixtures. The broach is simply pulled through the work by a hydraulic pulling mechanism operating on the same principle as that utilized in the universal horizontal machines made by this company.

Installation of these flat-top machines requires a hole in the floor to provide clearance for the hydraulic cylinder, which projects 36 inches below the base of the machine. In operation, the part to be broached is simply placed on the

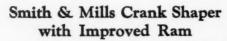


Lidkoping Centerless Grinder Introduced in this Country by the Triplex Machine Tool Corporation

flat-top table and positioned manually. The broach is then inserted in the hole to engage the puller, after which the machine is started, causing the broach to be pulled down through the work. At the completion of the broaching operation, the machine stops and the part is moved aside, after which the machine returns the broach to the loading position for removal.

All operating mechanisms are concealed within the machine base, which. is provided with an opening in one side for chip disposal. The machine illustrated is of 4-ton ca-

requires a floor space of only 42 by 65 inches. The table is 24 by 60 inches, and its flat surface is 48 inches above the floor.



The Smith & Mills Co., 2887 Spring Grove Ave., Cincinnati 25, Ohio, has developed an improved ram for the company's line of 12-, 16-, 20-, 25-, 28-, and 32-inch crank shapers. The old style driving slot arrangement has been completely eliminated in the new ram, a feature that results in greatly strengthening the ram without increasing its weight.

A self-locking feature for the ram is another important advantage of the new design, which eliminates the necessity for locking the ram manually in position. The position of the

204-Machinery, February, 1946



"Producto-Chek" Set of Gages Manufactured by the Gage Division of the DoAll Co.

pacity and has a 30-inch stroke. It ram is now automatically maintained at the point set by the operator. Positioning is accomplished by simply turning a conveniently located shaft. This can be done either while the machine is operating or at rest.

> The improved ram-carrier is so mounted that it slides on the bottom of the ram. The thrust of the cut is taken on a ram adjusting screw of large diameter mounted between ball thrust bearings. An automatic compensating double nut is employed to prevent backlash between the screw and the ram-carrier. This nut furnishes sufficient friction to prevent any change in adjustment when taking the heaviest cuts.

DoAll "Producto-Chek" Gage Kit

A new gage kit designed for production checking, as implied by its name "Producto-Chek," is being manufactured by the Gage Division of the DoAll Co., 1301 Washington Ave. S., Minneapolis 4, Minn. This set consists of a number of instruments designed for use in conjunction with gage-blocks for the quick setting up of practically any type of inspection gage, including dial indicating snap gages, plain bench comparators, dual bench comparators. angle comparators, square comparators, precision height gages, depth gages, and a series of "Go" and "No Go" snap gages of any size up to 18 inches. Plug gages and internal gages of any size in steps

of 0.0001 inch can be quickly made up from this set. In addition, gages such as hole to hole, hole to base, parallel bore, pitch diameter, and many others can be made up for special applications.

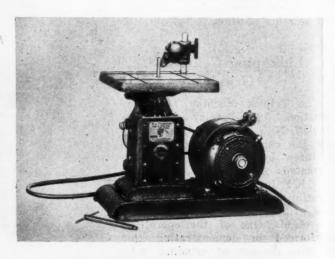
Unusual types of gages included in this kit are an indicating snap gage with dial indicator, internal gage with dial indicator, and an angle comparator using two dial indicators which can be set with a sine bar. The set weighs 40 pounds, and is housed in a hard wood box 10 by 20 by 4 inches.

Precision Die-Filing Machine

The All American Tool & Mfg. Co., 1014 W. Fullerton Ave., Chicago 14, Ill., has brought out a precision die-filing machine designed to insure a high degree of accuracy in performing filing, honing, and sawing operations. A patented universal



Smith & Mills Crank Type Shaper with " with Improved Ram



Die-filing Machine Made by All American Tool & Mfg. Co.

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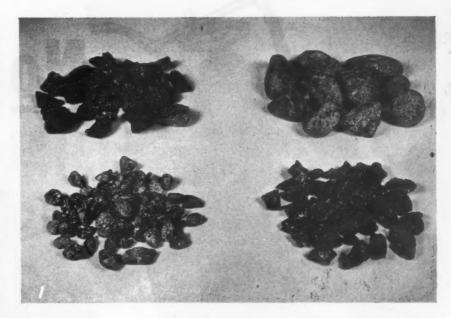
joint clamping arrangement is employed to assure accurate vertical positioning of the file or other tool, even though the shank is warped or twisted. A file-setting square is supplied for aligning the file or other tool before clamping, and an overarm with a hardened steel roller holds the file against the work.

The file is actuated by a Scotch yoke mechanism which runs in an oil bath, the height of which can be observed through a window in the housing. Locking thumb-screws on the outside of the housing facilitate quick, accurate adjustment of the vertical shaft bearings. A Neoprene bellows seals the housing against oil seepage or the entrance of chips.

The tilting work-table is 8 1/4 by 8 1/4 inches. The driving power is furnished by a 1/6-H.P., 110-volt, alternating-current motor operating at a speed of 1725 R.P.M. The file or other tool has a stroke of 3/4 inch and is driven at the rate of approximately 425 strokes per minute. The universal-joint file clamp has a capacity for holding tool shanks from 1/8 to 1/4 inch in diameter. _______68

Westinghouse Portable Brazing Equipment

A line of self-contained portable brazing sets that only require connection to a 220-volt power source to make them ready for joining members of copper, brass, bronze, or various alloys by brazing has been made available by the Westinghouse Electric Corporation, Pittsburgh 30, Pa. These sets are especially adapted for use in shipyards, railroad shops, or wherever it is desirable to take the brazing equipment to the job.



Abrasives of Special Form Developed by the Norton Co. for Wet Tumbling

The sets consist essentially of a transformer for providing high current at low voltage, suitable voltage selectors, controls, and carbon-tipped tongs that can be clamped over the pieces to be joined. The high currents flowing through the carbon tips bring them to incandescence, quickly raising the material to brazing temperatures of from 1200 to 1500 degrees F.

The three sizes available have capacities of 5, 10, and 20 K.V.A., the two smallest units being air-cooled, while the large unit is fan-cooled and has a self-contained water-cooling and recirculating system for cooling the brazing cables and tongs. The smallest unit weighs about 30 pounds, the intermediate 100 pounds, and the largest size 250 pounds. The corresponding secondary currents are 625, 833, and 1667 amperes. 69

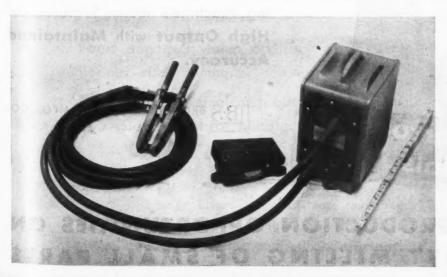
Norton Alundum Abrasives for Wet Tumbling

The Norton Co., Worcester 6, Mass., has developed a special form of Alundum abrasive for use in wettumbling operations. This new hard, heavy, tough, and fast-cutting aluminum-oxide product is said to be giving excellent results in the cleaning, deburring, finishing, and development of radii on a wide variety of metal parts. It is available in four size groups—namely, 1/4 to 1/2 inch, 1/2 to 3/4 inch, 3/4 to 1 inch, and 1 inch to 1 1/2 inches in diameter, either untumbled or with the sharp corners rounded off by tumbling. The accompanying illustration shows the smallest and the largest sizes in tumbled form and the other two sizes untumbled. The extreme hardness of the Alundum abrasive provides continuous fast cutting action without glazing over.

Normally, this abrasive is used with water and a cleaner. It is said to have eliminated the variable results obtained with the usual manual bench operations. Radii on gears, for instance, have been held to exact blueprint specifications while costs were considerably reduced. Precision parts are being consistently held to a 1 micro-inch finish by tumbling with these abrasives. ______70

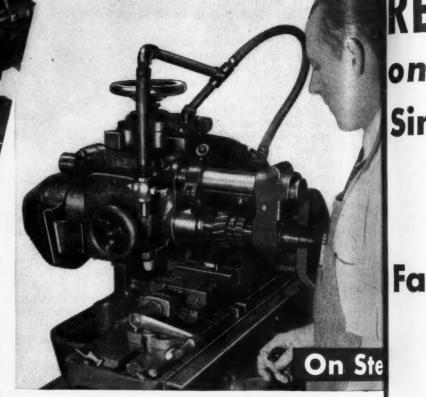
Solid Reamers with Flute-Long Carbide Tips

A new carbide-tipped solid reamer, with the carbide tip extending the full length of the fluted section of the tool is now available from the



Westinghouse Portable Brazing Set

Nº 000's 01



On Cast Iron

On Non-ferrous Materials Investigate the No. 000 Plain Milling Machine's many features for High Output with Maintained Accuracy.

BS BROWN & SHARPE MFG. CO.

IMPROVES PRODUCTION OPPORTUNITIES ON THE QUALITY MILLING OF SMALL PARTS

RROWN



OPERATING EFFICIENCY REDUCES MILLING COSTS on a wide variety of materials Simple Set-up

Single table dog engages cutting feed.

Speed and feed changes quickly and easily made.

Transverse and **vertical** adjustments conveniently accomplished from front of machine.

Fast Operation

Automatic milling cycle reduces non-cutting time to a minimum.

Start >		Advance in Fast Travel	Cutting Feed-Engaged	by Dog
(manual)			The state of the s	Automatic
Stop	-	Return in F	Fast Travel	Reverse

Rapid advance of work to cutting position by power and the 38" minimum length of cutting feed permits milling short cuts efficiently.

Accuracy

Feed engaged within accuracy of 1/16" — permits close timing.

Consistent reversal of table within accuracy of .002" — ideal for blind cuts.



Broad ranges of feeds and speeds permit using cutters down to the smallest end mills — efficiently.



SHARPF

ting section, and that scoring or galling is reduced to a minimum, particularly when reaming in cast iron and other materials that have an abrasive action.

Power Table Feed for Nichols Miller

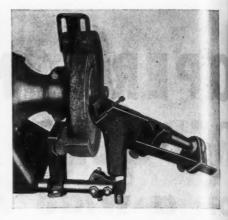
W. H. Nichols & Sons, Waltham, Mass., for whom the Nichols-Morris Corporation, 50 Church St., New York 7, N. Y., is distributing agent, are now manufacturing a power table feed attachment for the Nichols milling machine. This attachment can be added to a miller at the company's factory or it can be attached by a mechanic to any Nichols miller now in use. When shipped for field installation, a complete kit is supplied so that no extra equipment is required.

This power feed provides rapid approach, maximum correct cutting feed, fast table return, and shut-off; thus the operator need only load and unload the work, making it possible in many cases for one man to operate two or more machines.

Super Tool Co., 21650 Hoover Road, of a Bellows air-feed unit used in Detroit 13, Mich. It is stated that conjunction with a Hydro-Check. the new reamer virtually eliminates Both the air and hydraulic units wear on the flutes back of the cut- have stepless adjustment, and can be set to suit the work. The attachment provides a cutting stroke of 9 inches, and can be operated from any shop air system supplying air at a pressure of 75 to 175 pounds per square inch. The illustration shows the air cylinder and the Hydro-Check mounted on a Nichols miller. It also shows the machine equipped with a heavy air-operated

Improved "Ind-L-Way" Drill Grinding Fixtures

The Industrial Mfg. Co., 1900 Euclid Ave., Cleveland, Ohio, is now building improved "Ind-L-Way" drill grinding fixtures in two models for sharpening all sizes of drills from 1/4 inch to 2 7/8 inches in diameter and up to 26 inches in length. These fixtures are designed for the precision-grinding of drills to obtain faster and more accurate cutting. They are made especially for use with Black & Decker and Van Dorn bench and pedestal grinders, but can be applied to grinders of other makes which have the same dimen-Basically, this attachment consists sions and are of similar design.

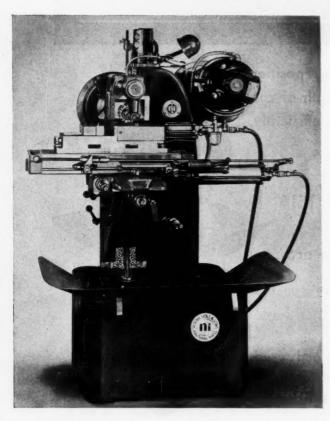


Drill Grinding Fixture Made by The Industrial Mfg. Co.

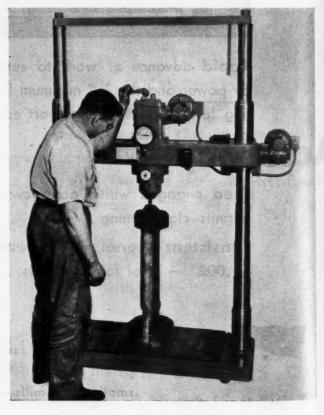
A combination of one of these fixtures and a grinder provides equipment for precision-grinding drill points on all kinds or types of drills. Adjustments are provided for quickly securing the proper angular setting for each operation.

Brinell Testing Machine

A machine designed for the Brinell testing of heavy and difficult to handle specimens has been developed by the Steel City Testing Laboratory, 8843 Livernois Ave., Detroit 4, Mich. A hardened steel plate on



Nichols Miller Equipped with Power Table Feeding Attachment



Brinell Testing Machine Developed by the Steel City Testing Laboratory

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A. Shapers · Shears · Brakes

Paid for itself 4 times!

This Cincinnati Press Brake bending ends on hopper chutes in a railroad shop paid its cost four times in three years.

Cincinnati Press Brakes are versatile and busy machines, as the same machine will punch, bend, form or corrugate both ferrous and non-ferrous metals.

Modern in design, modern in performance, and modern in speed and accuracy, they are profitable tools.

Write for instructive brake catalog B-2. It illustrates many press brake applications.



the base of the machine, only 3 inches from the floor, provides a solid foundation for supporting the specimen to be tested. This machine, identified as Type A4, can be set up in any assembly line or in any position to suit testing requirements.

The cross-head motor is operated by a reversible switch. Pressure upon the head is exerted hydraulically. The machine is equipped with either a standard Brinell microscope for reading the diameter of the impression or with a direct-reading attachment. It is furnished with overload protection, and is available in two sizes—3 feet 8 inches between standards for testing specimens up to 51 inches in height, and 22 inches between standards for testing specimens up to 24 inches in height...74

Motor-driven Portable Hydraulic Press Developed by the Northern Tool & Machine Co.

Northern Hydraulic Press

motor-driven, self-contained, portable hydraulic press of 20 tons capacity has been developed by the Northern Tool & Machine Co., P. O. Box 68, Melrose Park, Ill. This press has a massive arch type heat-treated frame of fabricated steel-plate construction designed to divide the load between the two sides of the press to eliminate distortion or any tendency to "walk." The press is suitable for broaching, forcing, bending, straightening, trying out dies and' molds, forming, embossing, riveting, piercing, flanging, staking, upsetting, crimping, assembling, and clamping operations.

The arch is 14 inches high by 24

inches wide. The alloy-steel platen is 16 by 18 by 2 inches, and is ground on both sides, drilled, and tapped to accommodate all set-ups within the capacity of the press. The power stroke speed is 90 inches per minute, and can be easily adjusted to any length from 0 to 12 inches. Tonnage or applied pressure can be controlled without retarding the ram speed.

When the ram is fully extended, 12 inches of its length still remains in the cylinder and serves as a pilot to insure accurate vertical travel without side play. The return stroke travel of the ram is 120 inches per minute. The ram is of chromefinished steel, and has an outside diameter of 4 inches. The end cap

on the ram can be bored out to take a tool-shank adapter. The pressure control valve can be easily set to provide accurate adjustments from 1 to 20 tons, and has an air-eliminating feature which prevents "air locks." This arrangement provides smooth, steady power up to any predetermined pressure.

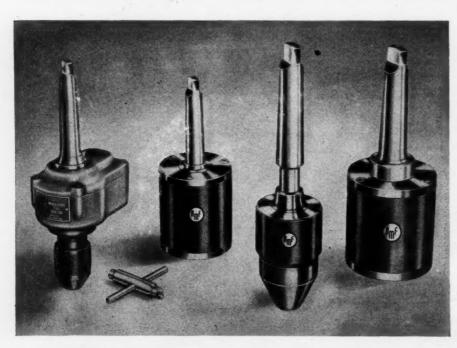
The ram travel speed can be increased or decreased and the ram stopped at any point in its stroke or held on the work under pressure while the motor idles or is turned off. A gage, located at eye level, is calibrated in tons of pressure and pounds per square inch.

Wahlstrom Automatic Drill Chucks and Tapping Attachments

The Wahlstrom Tool Division of the American Machine & Foundry Co., 5502 Second Ave., Brooklyn 20, N. Y., is now manufacturing a line of fully automatic drill chucks and tapping attachments. The fully automatic tapper shown at the left in the illustration is designed for sensitive, smooth operation when power is applied for driving the largest size tap within its range, as well as the smallest size tap. In tapping, the power increases in proportion to the pressure exerted on the handle, yet the slightest upward movement of the drill press handle instantly reverses the direction of rotation.

The positive safety driving clutch arrangement is designed to eliminate tool breakage. If the tap becomes clogged or if the tap comes in contact with the bottom of a blind hole, the drive is instantly thrown out of motion. The spindle, however, will continue to revolve, ready to resume operation. The reversible clutch forces the tap to revolve in a forward direction the instant it clears the work. This tapper is made in three size ranges— 2-56 to 1/4 inch; 5-40 to 1/2 inch; and 3/8 to 1 inch.

The fully automatic drill chucks of this new line are so designed that it is not necessary to stop the drill press when changing tools. They require no keys or collets, a slight grip on the knurled sleeve serving to open the jaws and release the tool. Another tool can then be inserted and the sleeve released to permit the jaws to automatically grip the tool. These chucks are automatically self-centering and are not limited to regular drill-press work, but can also be used for boring, milling, spot-drilling, and reaming.



Wahlstrom Automatic Tapping Attachment and Drill Chucks

IT'S A "SUPER" FAMILY

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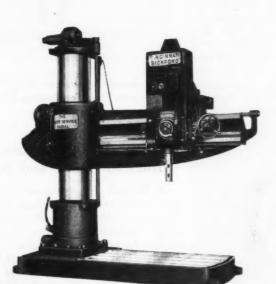
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Modern in every way, these tools bring every convenience to the operator, and are the result of years of development and experience, and the application of advanced engineering thought. Accuracy, ample power, ease of control and profitable performance are found in every machine in the line.



SUPER-SERVICE RADIAL

Productive, economical, accurate in performance—with ample power and great ease of control. Sizes: 3' arm, 11" column, to 8' arm, 19" column.



SUPER-SERVICE UPRIGHTS

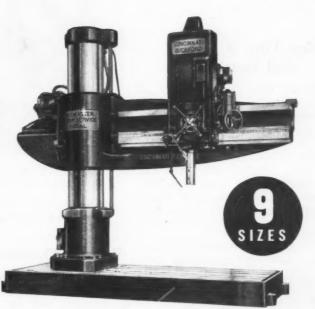
Sturdy, simple and convenient controls for wide ranges of feeds and speeds furnished in both round and box type columns. Sizes: 21", 24" and 28".



HIGH-SPEED SUPER-SERVICE RADIAL

Central controls, extreme ease of handling—highly productive, nine spindle speeds up to 3500 R.P.M.; 3' and 4' arm; 9" column.





MASTER SUPER-SERVICE RADIALS

For the heaviest jobs. Centralized controls. Forty horse-power, constant speed driving motor. Accurate and easy to handle. Sizes: 22" column, 7' to 10' arm; 26" column; 8' to 12' arm.



Write for detailed Bulletin R-24A. See our condensed catalog in Sweet's File

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

The Model B drill chuck, shown in the second view from the left in the illustration, is designed to hold straight-shank drills, and can be used for tapping by simply grinding three flats on the tap shank. It is especially adapted for tapping nuts, and is available in three size ranges—15/64 to 1/2 inch with either No. 1 or No. 2 Morse taper shank; 3/8 to 3/4 inch with either No. 2, 3, or 4 Morse taper shank; and 17/32 to 1 inch with either No. 3 or No. 4 Morse taper shank.

The Model A chuck, which is shown in the third view from the left, will hold the smallest sizes of numbered drills, and is made in two size ranges—1/64 to 3/8 inch with No. 1 or No. 2 Morse taper shank, and 1/32 to 1/2 inch with No. 1, 2, or 3 Morse taper shank.

The Model C drill shank, shown at the right, is designed especially for holding taper-shank tools. It will hold tools with No. 1, 2, or 3 Morse taper shanks, and can be fitted with either a No. 3 or No. 4 Morse taper shank. This chuck will hold tools either with or without tangs.......76

New Line of Radial Ball Bearings

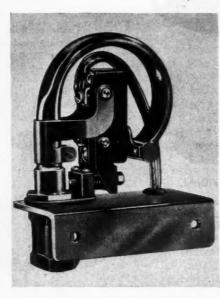
A Series 1600 inch-size line of low-cost precision radial ball bearings with solid inner and outer rings and ball retainer has been placed on the market by the Nice Ball Bearing Co., 30th and Hunting Park Ave., Philadelphia 40, Pa. These bearings have been especially designed for a wide range of precision applications where close-toler-



Precision Radial Ball Bearing Brought out by the Nice Ball Bearing Co.

The Model B drill chuck, shown ance units are required for medium the second view from the left in loads and for maximum speeds of e illustration, is designed to hold about 3000 to 5000 R.P.M.

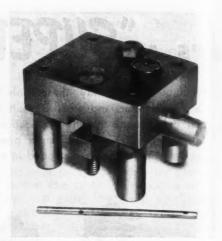
The one-piece inner and outer races of these bearings have all surfaces accurately ground to close tolerances, special attention being given to obtaining maximum contour accuracy and high micro finish in the ball grooves to assure quiet, smooth operation and longer life. A ball retainer or separator is incorporated in the new bearings to reduce ball friction and increase the range of allowable speeds. The 1600 series bearings are available with double shield, one shield, or without shields. All bearings can be furnished with or without grease packing, except the double-shielded units, which are regularly grease-packed. 77



Pressure-operated Switch Made by the Meletron Corporation

Pressure-Operated Switches

A new line of George A. Starbird industrial pressure-operated switches brought out by the Meletron Corporation, 950 N. Highland Ave., Los Angeles 38, Calif., includes industrial pressure-operated switches of various models which cover an operating range of from 30 inches of vacuum to 5000 pounds per square inch. The Type A unit illustrated has a Micro switch, and is suitable for fixed-pressure differential applications to operate from 25 to 3000 pounds per square inch. The minimum differential pressure is 25 pounds, and the minimum operating pressure tolerance plus or minus 10 pounds. All adjustment screws are readily available. The unit illustrated weighs 1 pound, and measures 3 1/2 by 2 by 5 inches.



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Jig Developed by the Fifty Plus Machine Shop for Drilling Crosswise Holes

Jig for Drilling Cross-Pin Holes in Shafts and Studs

A V-block jig designed to facilitate quick, accurate drilling of crosspin holes through shafts, studs, or other cylindrical pieces requiring drilled holes at right angles to their longitudinal axes has just been placed on the market by the Fifty Plus Machine Shop, 43 Twentysecond St., Irvington 11, N. J. As shown in the illustration, the jig consists of an inverted V-block supported by four studs or columns, a crosswise clamping bar, two clamping studs, and a knurled-head slip drill bushing, which is accurately positioned in the V-block above the center of the V-groove.

With this jig, the machinist or toolmaker simply places the piece to be drilled in the V-block, tightens the two clamping studs to hold it in position, places the jig on the drill table and spots the work with a drill guided by the slip bushing, removes the slip bushing, and without changing the position of the jig, drills a hole of the required size through the work. The hole thus drilled will be at right angles to the work axis and accurately centered within 0.001 inch.

The jig is made of cold-rolled steel, carburized and ground for acted curacy, wear resistance, and to perblimit accurate location of the work from the squared ground surfaces in of the V-block. The block can be used for drilling crosswise holes through very small round pieces, such as shown in the foreground of the illustration, as well as for larger pieces up to approximately 1 inch in diameter. It is about 2 1/2 by 2 3/8 inches.

Colonial Press Equipped for Sizing and Finishing Bores of Shock Absorbers

is being accomplished at the rate of 720 pieces per hour on a "Utility" hydraulic press built and equipped by the Colonial Broach Co., Detroit 13, Mich. The operation consists of pushing hardened steel balls through the tubes to finish them to 1-inch inside diameter. For this purpose, the automatic indexing fixture shown in the close-up view, Fig. 2. An automatic loading and feeding mechanism for the steel balls is also built into the machine.

The press operates on a continuous cycle, even unloading of the work being performed automatically. The operator merely drops the tubes-two at a time-into the indexing fixture at the loading station. The ram of the press is fitted with a head having four push-rods. The two push-rods nearest the column of the machine push the steel balls through two of the tubes simultaneously. The two rods at the right eject the finished tubes from the fixture. The automatic ball-feeding mechanism is shown at the left.

The close-up view, Fig. 2, shows the fixture with the ball chutes in the background. As the indexing movement of the fixture brings two

Fig. 1. Colonial Press Equipped Finishing Bores of Steel Shock-absorber Tubes

Automatic finish-sizing and sur- tubes into position in front of these face-conditioning of the bores of chutes, triggers release two balls steel-tube shock-absorber housings which roll into position on the tops of the open-end tubes. In the next machine station, the balls are pushed through the tubes, from which they drop into a lower hopper. From this hopper the balls are raised to the upper hopper by the hydraulically operated feeding mechanism, which is interlocked with the machine the press, Fig. 1, is equipped with cycle. More than two balls are used in the machine, of course, the design of the feed mechanism being

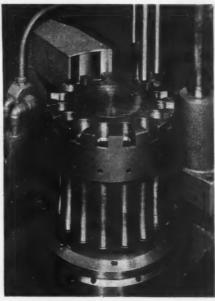


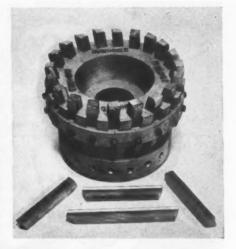
Fig. 2. Close-up View of Automatic Indexing Fixture of Colonial Press Shown in Fig. 1

such that when two balls are raised to the upper hopper they serve to force two similar balls into the chutes, ready for release by the trigger mechanism. When the finished tubes reach the station at the extreme right of the machine, the two rods shown in the foreground of Fig. 2 push the tubes down and out through an opening in the side of the machine base.

The machine is operated hydraulically throughout, including the indexing and feeding movements. The machine has a rating of 6 tons and a maximum stroke of 18 inches.....80

Milling Cutter with "Cushioned" Blades

The General Tool & Die Co., Inc., 555 Prospect St., East Orange, N. J., has developed a patented milling cut-



Milling Cutter of Radically New Design Developed by General Tool & Die Co.

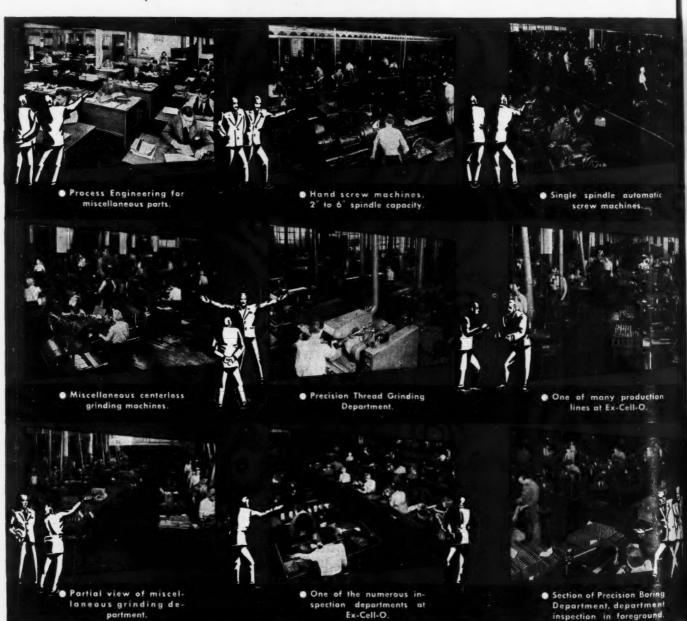
ter head with 12 per cent cobalt high-speed steel patented "cushioned" blades of novel shape, which has shown remarkable performance in test-milling operations on tough materials. One of these new heads, having a diameter of 6 inches and containing twenty cutters or teeth, is shown in the illustration. This cutter is being used to mill Max-L steel (similar to SAE 4150) at a cutter speed of 245 R.P.M., or the equivalent of about 370 feet per minute, without injury to the work or cutter.

Each blade is held in the head by two 5/16-inch set-screws, although the illustration shows only one setscrew in place. The cutter teeth are said to have a hardness of about 67 to 69 Rockwell C, and are ground with a circular groove parallel to the longitudinal axis. This groove creates unusual shear angles, which are said to result in a fine finish even while taking a roughing cut. In tests with the new cutter, it is claimed that metal has been removed at the rate of 4 cubic inches or more per horsepower per minute.____81

Lewis-Shepard Improved "Handy Hoister"

New features have been added to the "Handy Hoister" made by Lewis-Shepard Products, Inc., 245 Walnut St., Watertown, Mass., for lifting and transporting tools and raw materials. Among the new features incorporated in this hoist are heavygage steel construction of the bracket, back-plate, and platform; roller-bearing sheave on hardened and ground shaft; strong, channel type uprights; tubular bracing and





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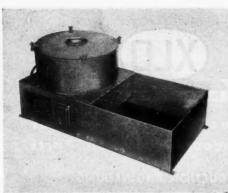
For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

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Folder illustrating Ex-Cell-O's complete parts production facilities will be sent you upon request. Write or wire Ex-Cell-O loday and ask for Ex-Cell-O Bulletin No. 36151.









(Left) Stationary "Centri-Power" Coolant Filter. (Center) Mobile Coolant Filter. (Right) Sump Cleaner

base members; ball-bearing guide ill effect on the efficiency of the lockwheels; open-end base; swiveling casters; and ball-bearing mounted wheels, which are available in semisteel, rubber, or Celeron. This hoister is available in a CH type with casters at the front, and in a DH type with a handle at the front...

Woodworth "Cone-Lok" Unit and Fixture Clamp

The "Cone-Lok" fixture clamp (Fig. 1) and the "Cone-Lok" unit (Fig. 2) have been added to the line of adjustable clamping jigs made by the N. A. Woodworth Co., Ferndale, Mich. The "Cone-Lok" fixture clamp is a self-contained unit designed to meet the great majority of workclamping requirements. This fixture clamp is provided with the "Cone-Lok" mechanism, consisting of inner cones formed on the pinion shaft and closely fitting the outer cones which are integral with the housing. With this arrangement, the normal amount of wear on the cones has no

ing action.

This fixture clamp is being used to advantage in holding work for milling operations. Movement of the plunger is possible only by actuation of the operating lever. Work can be positively clamped at any position within the stroke range of the plunger. Severe chatter due to heavy milling cuts will not loosen the clamp. The clamp is made in three sizes, with plunger travels of 3/4 inch, 1 1/32 inches, and 1 3/4 inches, with a 180-degree lever movement.

The "Cone-Lok" unit is also manufactured in three standard sizes. This unit, consisting of rack, pinion, bushing, and lever, is designed for incorporation in fixtures and machines of special design. In order to apply this unit, it is only necessary to bore two straight holes of the proper diameters through the jig or fixture and insert the rack plunger in one hole and the bushing in the other. The bushing is locked in place by four socket-head cap-screws supplied with the unit.

Fig. 1. Woodworth "Cone-Lok" Fixture Clamp

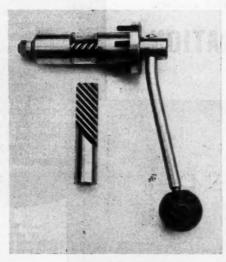


Fig. 2. Woodworth "Cone-Lok" Unit for Assembly in Fixtures

Honan-Crane Sump Cleaners and Coolant Filters

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The Honan-Crane Corporation, 912 Sixth St., Lebanon, Ind., has added four new products to its line of oilpurification equipment. These new products, three of which are shown in the illustration, are designed to improve machine tool production, prolong tool life, cut down work rejections, and simplify sump-cleaning operations.

The "Centri-Power" coolant filter, shown to the left, is designed for stationary installation to replace or supplement machine tool sumps. Filtering is accomplished by centrifugal action, which forces the coolant through a filter pad. Continuous operation of the filter removes abrasives as fast as accumulated and assures a clean supply of coolant at all times. Blower vanes circulate a large volume of air through the coolant stream and thus maintain the coolant near room temperature. The flow rate is 15 gallons per minute on mineral oils and 20 gallons per minute on soluble oils. This unit is 48 1/2 inches long, 23 inches high, and 24 inches wide.

The mobile coolant filter, shown at the center of the illustration, is designed to remove, filter, and replace oils or coolants used in machine tool operations. This mobile filter operates directly on the machine tool sump. It is simply wheeled beside the machine to be serviced, its suction hose is inserted in the sump. Flow from the return or discharge hose is used to stir up and flush all abrasives and dirt. The unit is mounted on 26-inch steel wheels, stands 64 inches high, and is 60 inches long by 30 inches wide.

The sump cleaner shown at the right in the illustration is designed for the removal of oil, dirt, chips, etc., from sumps or tanks of machine tools, gear-cases, compressors,

JALLOY STEEL NEW, TOUGH, DUCTILE, DURABLE, FOR DYNAMIC JOBS

Jalloy is a new steel developed originally by J&L as tank armor. It is a steel designed for action, to meet stresses, heavy shocks, and to resist the forces of abrasion. Its great strength makes possible radical changes in design and affords substantial reduction in weight. Its welding, forming and forging qualities are excellent. Jalloy responds to heat treatment with exceptional uniformity.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

MACHINERY, February, 1946-217

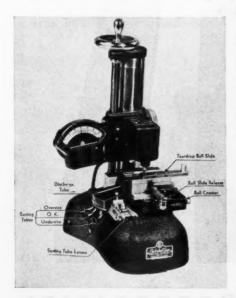
engines, and quenching systems, as well as sumps and tanks containing other liquids. In operation, this unit is wheeled beside the sump. When the tank of the cleaner is filled, the motor stops automatically.

The fourth unit is an oil-transfer truck and sump cleaner which functions much the same as the mobile sump cleaner, but can also be used as an oil dispenser. Instead of a self-contained tank, this equipment is fitted with a removable barrel or closed-end drum.

Pratt & Whitney Electrolimit Comparator with Ball-Sorting Attachment

The P & W Model BE-748 Electrolimit ball-sorting gage here illustrated was brought out by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., to provide a fast and accurate method of inspecting, by mechanical means, the quality of small lots of precision balls. The inspection operation is speeded up substantially by the addition of the cup type hopper and tube, which can be attached to the instrument as shown.

The ball slide is designed to allow positive positioning of the ball between the button on the anvil and the diamond gaging point when the ball slide is in the gaging position. Deflection of the ball-slide release lever allows the slide to be moved from the gaging position to the unloading position and simultaneously trips the ball-counting device.

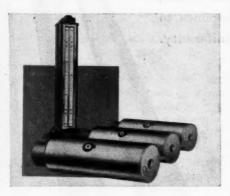


Electrolimit Ball-sorting Gage Brought out by Pratt & Whitney Division Niles-Bement-Pond Co.

The ball slide can be conveniently operated to and from the loading position by the right index finger, the right thumb depressing the ball-slide release lever. The sorting tube levers are conveniently positioned for operation by the left hand, leaving the right hand free for simultaneous operation of the ball slide. The indicating meter can be graduated to permit inspecting balls to 0.0001, 0.00005, and 0.000001 inch...85

Federal Gaging Heads for Use with High-Precision Air Gage

The Federal Products Corporation, 1144 Eddy St., Providence 1, R. I., has brought out a new group of



Federal Gaging Heads for Use with Air Gage

Class B gaging heads for use with the Federal-Metricator air gaging system. These gaging heads are available in sizes of from 0.240 inch up to 2.510 inches in diameter.

They are said to provide the same accuracy as the higher priced gaging heads, since it is not necessary that the head or plug fit the gaged hole as precisely as ordinary or conventional plugs when gaging by air. The diameter of the plug acts primarily as a guide for centering it in the hole.

These gaging heads differ from the regular heads furnished for use the Federal-Metricator air gaging system in that they are not chrome-plated and lapped. They are made of hardened steel and are fineground. Gaging operations performed with this air-system equipment reduce the factor of human error to a minimum, and permit quick determination of the hole dimensions, including diameter, outof-roundness, taper, bell-mouth, or other irregularities to an accuracy of 0.000025 inch.



Pneumatic Three-way Pilot Valve Made by Modern Products, Ltd.

"Modernair" Pneumatic Three-Way Pilot Valve

A new "Modernair" three-way pilot valve designed for use in the application of controlled air power to machine tools has been placed on the market by Modern Products, Ltd., 952 S. Grand Ave., Los Angeles 15, Calif. This CRV pilot valve is designed to be used as a three-way valve, normally either open or closed, or as a two-way valve, normally open or closed.

Installation as a two-way pilot valve is effected by simply plugging one port. The valve is compact, being 3 1/4 inches over all with the piston fully extended. It can be operated either by hand, foot-treadle, or by a cam which can be part of a mechanism designed for a timed sequence of operations.

The valve can be used to operate air cylinders, air motors, air controls, and single-acting cylinders on air valves, air chucks, etc. In addition to air operation, the valve can also be used in low-pressure hydraulic control and actuating systems. It is impossible for the plunger of this valve to come out of the housing during operation, yet it can be readily removed to permit renewal of the packing rings without breaking any connections. It is fully balanced and operates freely under extreme variations in pressure. The ports are normally threaded to take 1/8-inch pipe fittings, but they can be machined to take other sizes. 87

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Form Tools and Adapter for Small-Lot Runs

The Keene Valley Engineering Co., Keene Valley, N. Y., has brought out a line of straight-shank cut-off and form tools and an adapter which permits these tools to be used in place of circular form tools for short

For lowest cost-SPECIFY THESE "STANDARDS"

Carboloy Standard Blanks include: 5 styles for "universal" use; 3 styles for reamers, scrapers (and centers)—in all the commonly used sizes and grades for machining all metals.

For 60-80% of all your carbide machining needs, you'll find Standard Carboloy Blanks tops in economy—flexibility—convenience. Here's why they rate so high in these important features—

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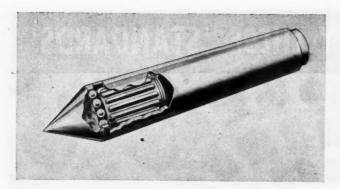
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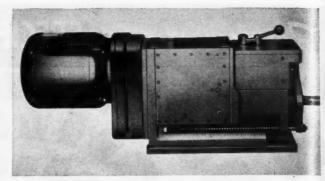
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CEMENTED CARBIDE

Blanks



"Star" Live Center Made to Same General Dimensions as a Standard Dead Center



Hesco Unit Developed for Operations such as Drilling, Reaming, Counterboring, and Spot-facing

this company is in a position to deliver on short notice cut-off, form, or combination cut-off and form tools made to the user's specifications.

Carboloy Gage Bushings

The Carboloy Company, Inc., 11147 E. Eight Mile Ave., Detroit 32, Mich., has announced that it is now carrying in stock, ready for immediate shipment, forty standard sizes of Carboloy "Go" and forty standard sizes of Carboloy "No Go" plug-gage bushings in rough form ready for finishing. These bushings range in size from a finished gage diameter of 0.366-0.406 inch to a finished gage diameter of 1.501-1.531 inches.

Carboloy rough ring-gage bushings for gages ranging from 0.059 inch to 1.510 inches in diameter are also available. The outside diameters of these bushings range from 3/8 inch to 1 15/16 inches. All gage bushings of this line are made of Grade 44A Carboloy, selected for its exceptional resistance to wear.___89

"Star" Live Centers

A compact live center with no overhang, known as the "Star," which has the same general dimensions as a standard dead center, is being manufactured by the Samuel S. Gelber Co., 32 S. Jefferson St., Chicago 6, Ill. The spindle is of high-grade alloy tool steel, heattreated to a hardness of 64 Rockwell and precision-ground. The shank is hardened and ground both internally and externally to obtain an accurate fit. It has thrust type ball bearings and radial roller bearings.

The bearings of this center turn

runs on lots of 25 to 10,000, or even on an anti-scoring concentrated lu-50,000 pieces, with substantial sav- bricant developed to withstand presings in tool costs. It is stated that sures of more than 50,000 pounds per square inch. A Neoprene seal protects the center against damage by abrasive materials and serves to retain the lubricant for the life of the center, which is said to be about 3000 hours when operating under full load capacity.

Hesco Drilling and Reaming Unit

A new drilling, reaming, counterboring, and spot-facing unit has been developed by the Hole Engineering Service, 13722 Linwood Ave., Detroit 6, Mich. This unit, known as the Hesco Model 100, is of completely mechanical construction, and provides positive feed rates, which establish control over production. It is compact in design, has a long feeding necessary.

stroke, is readily adjustable to suit the operation, and permits close grouping in multiple installations for unison or sequence operations.

The unit is available in either belt- or motor-driven types, and can be mounted at any angle. The motor of this new unit is mounted in a line with the head to form a streamline arrangement, instead of above the unit as in former models. The lead-screw feed provides absolute control over the size of chip per flute. Variations in feed can be easily effected by simply changing leadscrews and lead-screw nuts. Quick advance and feed depth are adjustable from the front of the unit. Hand control is provided for setting the tools, and remote electrical control is furnished through built-in limit switches. The entire mechanism of the unit can be removed from the housing when servicing becomes

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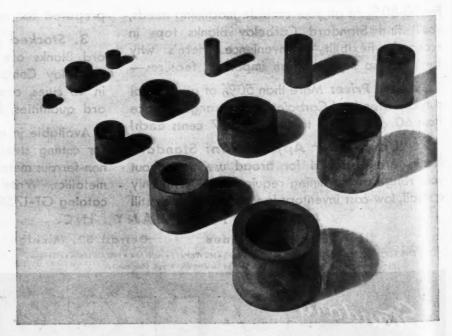
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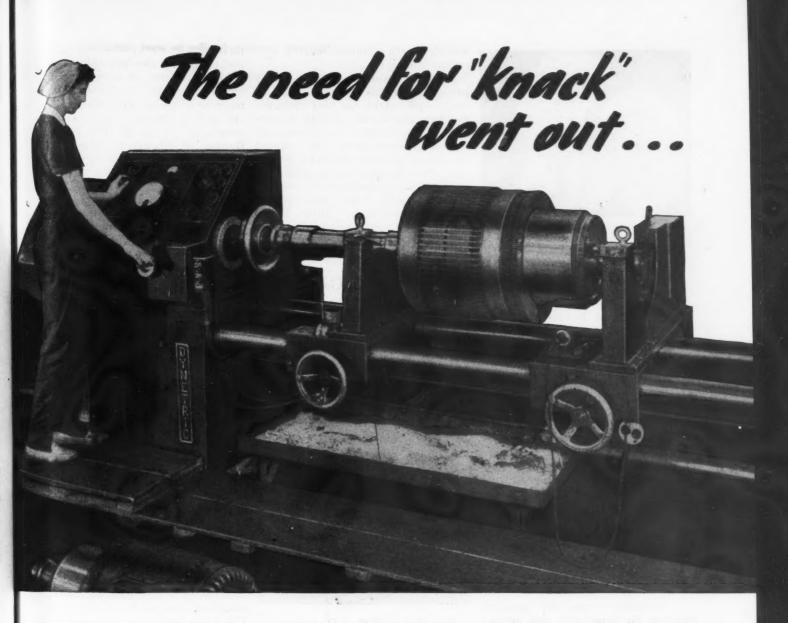
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Rough Carboloy Plug- and Ring-gage Bushings as Furnished Ready for Finishing to "Go" and "No Go" Sizes



When DYNETRIC BALANCING* came in!

Yes, the old "tricks of the trade" are out of date where static and dynamic balancing is done. To-day, with the Gisholt Dynetrics, the *machine knows all the tricks!* Now, even inexperienced personnel can balance rotating parts more quickly, more accurately than the best specialist could ever have done it by any other means.

GISHOLT DYNETRIC BALANCING MACHINES* take advantage of modern electronics to eliminate unbalance. As swift as they are accurate, these machines not only *locate* the source of unbalance but *measure* it as well. The operation is reduced to a simple dial reading. The required corrections are clearly indicated.

Gisholt Dynetric Balancing Machines are available in various sizes and types to accommodate any rotating assembly from ½ ounce up to 50 tons. They have put balancing on a low cost and a mass production basis. Any product which uses rotating parts needs this protection against destructive vibration. Literature on request.

GISHOLT MACHINE COMPANY
Page 1209 E. Washington Avenue Madison 3, Wisconsin

Look Ahead Keep Ahead With Gisholt



*A development of Westinghouse Research Laboratories.



Bayflex Abrasive Cut-off Wheels

Bayflex Abrasive Cut-Off Wheels

A new line of Bayflex wheels in which the abrasive has been incorporated in a cotton fiber bonding material has been brought out by the Bay State Abrasive Products Co., 21 Union St., Westboro, Mass. These wheels have been designed to meet the demand for faster cutting of non-ferrous metals with less danger of wheel breakage. It is claimed that the increased toughness and balanced flexibility of the new bonding material not only provide the desired safety factor and faster cutting qualities, but also give sufficient flexibility to permit side grinding and close following of the work surface in contour grinding. 92

Young Expanding Mandrel

A precision expanding mandrel designed for production and inspection work in tool-rooms and machine shops is being manufactured by the Young Arbor Co., Department L, 3257 Bradford Road, Cleveland Heights 18, Ohio. Work placed on the mandrel is locked in place automatically by a novel roller-clutch expansion arrangement. The mandrel is adapted for holding work to be turned, ground, or polished. Under conditions where extreme cutting pressure is encountered, the mandrel

merely exerts a tighter holding grip teristics similar to steel which peron the work.

Material worked under heavy pressure can be released just as any temperature in the shop, tooleasily and quickly as that undergo- room, or inspection department. They ing light operations, such as deburring. No auxiliary power is required to expand the mandrel, and it cannot be sprung or damaged under normal. use. The mandrel is ruggedly constructed, has interchangeable sleeves, and is claimed to hold concentricity within exceptionally close limits throughout the entire length of the work. __

DoAll "Lifetime" Gage-Blocks

The "Lifetime" gage-blocks recently brought out by the DoAll Co., 1301 Washington Ave., S., Minneapolis 4, Minn., were developed to



New "Lifetime" Gage-block Made by the DoAll Co.

broaden the range of adaptability of gage-blocks and provide a set of blocks having improved wearing qualities that the average person can use without difficulty. It is claimed that these important advantages have been made possible by the use of "DoAlloy," a wear-resistant alloy having expansion charactable or work-bench. This valve

mit using the new gage-blocks with a higher degree of accuracy under are said to exceed in accuracy the standards set up by the National Bureau of Standards, remain flat under severe temperature changes, and retain their accuracy through a temperature range of from 120 degrees below to 500 degrees above zero. The surface finish of these blocks averages 0.5 r.m.s., and has a bright silvery appearance.

All blocks of 0.250-inch size or smaller are made of solid "DoAlloy." Blocks 0.300 inch and larger are faced with "DoAlloy" on their wearing surfaces. This wear-resisting face is fused to a steel core in such a manner that it is impossible to separate them. The steel core of these blocks is chemically treated to provide a jet-black finish which penetrates the surface. The blocks are highly acid-resistant, and the surface is extremely hard. They are also rustproof. __

Mead Combination Threeor Four-Way Air Valves

The Mead Specialties Co., Department P-1026, 4120 N. Knox Ave., Chicago 41, Ill., has brought out a three- or four-way air valve adapted for a variety of applications. This valve has been simply designed and constructed to give long service with minimum wear on its moving parts. The valve seals are of the pocket type, lined with synthetic rubber to insure air-tight action and freedom from deterioration caused by oil or moisture in the line. The two hardened cam followers require only a 1/16-inch movement to operate the valve from its full open to its full closed position.

The Model 4WB bench valve, shown to the left in the illustration, is designed for use on a machine



Expanding Mandrel Made by Young Arbor Co.



Mead Bench, Foot, and Cam Type Air Valves



It's the simple basic design of the Simplimatic that makes it so extremely adaptable-so readily individualized to solve a variety of machining problems. And in every case, it gives you the high speed production and lower cost of an automatic lathe designed solely for the job at hand.

SIMPLIMATIC

Simpler tooling, easier operation, low cost production commend the Simplimatic wherever you have parts to produce in large volume. It can solve your problem as it has hundreds of others. Write for full information.

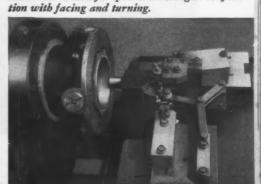


A few of its possibilities are illustrated herewith.

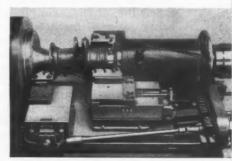
Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning



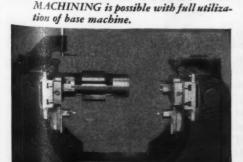
A LINKAGE ARRANGEMENT between the slides can be used for spherical boring in conjunc-



A VARIETY OF SLIDE POSITIONS is permitted by the large area of the platen table. Angular feeds are no problem. Compound slides are unnecessary.



TAILSTOCKS can be mounted on platen table for between-centers work; can be operated by band or pneumatically.



SIMULTANEOUS DOUBLE END

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Fig. 1. Robinson "Vibrashock" Unit Mount for Delicate Equipment

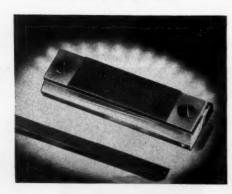
functions either as a four-way valve; two three-way valves; one three-way valve; or a three-way valve and a blower.

The Model 4W foot-control type valve, shown in the central view of the illustration, has a pressed-steel pedal and contains a cam which operates the valve either as a three-way or as a four-way control.

The Model 4WC cam-operated valve, shown in the view to the right, can be mounted on a drill press or other machine to obtain automatic control of the air cylinder by means of cams. 95

Diamond "R" Files and Hones

The Wendt-Sonis Co., Hannibal, Mo., has just placed on the market a new line of Diamond "R" files and hones designed for dressing carbide cutting tools without removing them from the machine. These new files and hones, developed to increase production through savings in dismounting and setting-up time, contain the diamond particles in a new metal bond which enables them to maintain a flat surface throughout their life and permits them to be used on high-speed steels without loosening the diamond particles.



Diamond "R" File and Hone

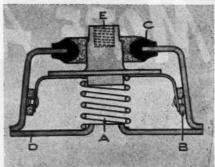


Fig. 2. Cross-section View of "Vibrashock" Unit Shown in Fig. 1

The file shanks are made of drill rod stock, and each file comes in a leather case provided with an instruction card. The hone is mounted on a Lucite base. The files are 6 inches long, 1/4 inch wide, and 3/16 inch thick. They are available in 240, 320, 400, and 600 grit. The hone is 3 inches long, 3/4 inch wide, 1/2 inch thick, and is made in 400 grit only.



Improved Saw-gun

Streamline Saw-Gun

The exterior appearance and mechanical operation of the saw-gun marketed by the Saw Gun Division of the Mid-States Equipment Corporation, 2533 E. 73rd St., Chicago 49, Ill., have recently undergone extensive improvements. This portable power saw and file can be propelled electrically, by air, or by flexible shaft. Ordinary hacksaw blades or files can be fitted into its holder.

The improvements include a new streamline housing, which is highly polished and perfectly balanced, and a tubular ribbed hand-grip, which is built into the housing and, through special construction, remains cool even after hours of continuous operation. The built-in grip is designed to give greater accessibility in out-of-the-way places. A pistol-grip detachable handle is provided as standard equipment. The interior mechanism of the saw-gun has also been completely revamped in order to insure smooth, dependable operation.

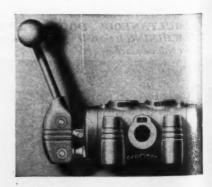
Shock-Absorbing Mounting for Delicate Equipment

A new type of anti-vibration mounting unit known as "Vibrashock," which is designed for the protection of delicate equipment, is being manufactured for a wide variety of applications by Robinson Aviation, Inc., Teterboro, N. J. The vibration dampening and snubbing system is contained in an aluminum housing of standard dimensions, designed as shown in Fig. 1.

The Vibrashock unit mount is made in three standardized sizes, ready for installation, to meet loadcarrying requirements varying from 1/2 pound to 45 pounds. A crosssection view of a typical unit mount is shown in Fig. 2. The principal load-bearing stainless-steel spring with three-way freedom of motion is shown at A. The built-in dampening mechanism designed to kill lowfrequency oscillations and minimize resonance at critical frequencies is indicated at B. At C are shown the built-in three-way limiting snubbers which serve as a resilient stop to limit heavy load shocks, and at D the housing provided with standard attachment holes in its base. The load-carrying central stud, tapped for standard machine screws, is shown at E. _

Gerotor Floating Piston Type Hydraulic Valve

The Gerotor May Corporation, Logansport, Ind., has developed a four-way hydraulic valve of a floating piston type designed to obtain high efficiency and easy operation. These valves are regularly made for oil service at pressures up to 1500 pounds per square inch, but can be furnished for pressures of 2500 to 3000 pounds per square inch. They can be supplied in non-corrosive materials for application in high-pressure water service installations.



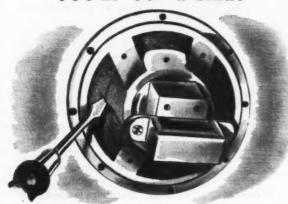
Gerotor Four-way Hydraulic Valve

INDEPENDENT INVESTIGATOR'S STUDY SHOWS

How Phillips Genews Saved Emerson Radio 411 Dail C

THIS INVESTIGATOR from James O. Peck Co., industrial research authorities, is visiting a number of representative plants to get au-thentic FACTS on assembly savings for you.

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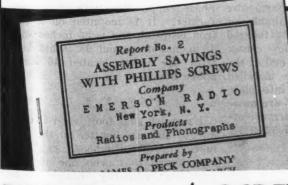
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That's only one way Phillips Screws save. They can be driven faster - allow use of power in place of hand drivers. They drive tighter fewer and smaller screws can often be used. Burrs and broken screw heads are eliminated, and the ornamental design improves product appearance.

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American Screw Co.
Atlantic Serew Works
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Atlantic Serew Co.
Central Screw Co.
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Continental Screw Cor.
Corbin Screw Corp.
Eleo Tool & Screw Corp.
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National Screw Co.
National Screw & Mfg. Co.
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PHILLIPS SCREW MFRS., c/o Horton-Noyes 2300 Industrial Trust Bldg., Providence, R. I.

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Gerotor four-way hydraulic valves assembling operation. In Fig. 2 is are offered in four types, having standard, spring-return, spring-centered, or ball detent actions, and in five different piston designs. They are made for either hand, foot, cam, solenoid, oil pressure, or air pressure operation, and can be had in seven sizes ranging from 1/4 inch to 1 1/2 inches.

Wales-Strippit Hole-Punching Units

A new line of Type BL holepunching units has been added to the punching and notching equipment manufactured by the Wales-Strippit Corporation, 345 Payne Ave., North Tonawanda, N. Y. These new units are independent and selfcontained, the punches, dies, stripping guides, stripping springs, and guide buttons all being incorporated in the holders, as shown in the broken section view, Fig. 1.

These holders automatically maintain alignment of the punches and dies. The only function of the press ram is that of pressing the punch through the work. Set-ups in which these units are employed are ready for production work as soon as they are placed in the press, and require no further adjustment of the units, punches, or dies. Tooling with the new hole-punching unit is simply an

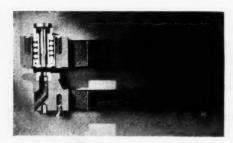


Fig. 1. Cut-away View of Wales Hole-punching Unit

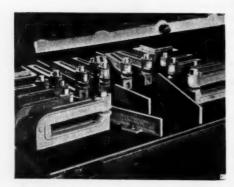


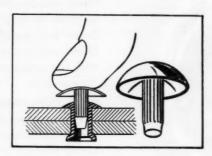
Fig. 2. Mounting Plate Set-up of Wales Punching Units

shown a mounting plate set-up of the punching units in a stamping press, ready for operation.

"Umbrella Plug" for Covering Heads of Hollow Cherry Rivets

A new product termed an "Umbrella Plug" has been added to the line of fasteners made by the Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif. This new plug was developed to meet the requirements of Cherry rivet users who desire to have the heads of the hollow type rivets match or harmonize with the surface color or texture of the material being fastened.

The "Umbrella Plug" fits into the center of the hollow type Cherry riv-

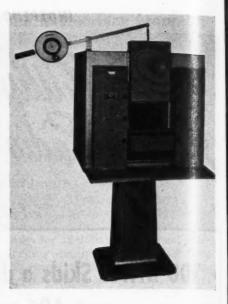


Covering Head for Hollow Cherry Rivets

ets, as indicated in the diagram, and furnishes an attractive smooth cap which completely covers the head of the rivet. These plugs are available in aluminum, copper, or plastic, and can be colored to match or harmonize with any material. The shanks of these plugs are knurled and tapered to fit tightly into the hollow center of the rivet. The pointed end of the shank is inserted in the installed rivet and simply pushed into place by hand. "Umbrella Plugs" are made for use in hollow type Cherry rivets having diameters of 1/8, 5/32, 3/16, and 1/4 inch.

Sentry Electric Heat-Treating **Furnace**

The Sentry Co., Foxboro, Mass., has just added to its line of Model Y high-speed steel hardening furnaces a new and larger size designated No. 5. This furnace has a muffle chamber 7 inches high, 8 7/8 inches wide, and 20 inches deep. Through the use of larger sizes of Sentry



Electric Heat-treating Furnace Made by the Sentry Co.

diamond blocks, high-speed steel tools up to 5 by 7 by 14 inches can be hardened, free from scale or decarburization.

The heating elements extend from the front to the rear of the furnace beside the removable muffle chamber. The heating-element terminals are the same as the patented air-cooled type used on other Model Y furnaces made by this company. The furnace heating chamber is designed to reflect heat toward the muffle-chamber opening to offset the cooling tendency at this point. Terminals and electrical connections are protected by removable metal guards.

The furnace has a maximum rating of 42 kilowatts and can be directly connected to a 220-volt, threephase supply line without a transformer. It is mounted on a castiron pedestal, and is 36 inches wide, 48 inches deep, and 68 inches high, with the hearth located 46 inches above the floor.

Excessive gear tooth wear is often due to abrasive matter in the gear lubricant. Westinghouse engineers have found that even fine abrasive dust not ordinarily thought to be harmful can cause a great deal of trouble. In some instances ore dust or even log-bark dust has caused considerable difficulty. In one case, gears of a turbine-driven induceddraft fan were wearing fast and becoming noisy in a matter of days. It was found that there was a small amount of "fly ash" in the lubricating oil. An adequate oil filter completely eliminated the trouble.

RIGIDITY for Close 7olerances airplane and allied plants. tance to deflection. no thrust loads. accuracy investigate Sidney Lathes.

End view showing complete gear train which rotates on anti-friction bearings. The pulley mounted on pre-loaded anti-friction bearings is full floating on a sleeve bolted to the headstock to eliminate deflections of the drive shaft creared

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The four wall bed construction with cross girts at 12 inch intervals not only differs from conventional construction but assures sustained accuracy and resis-

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Bulletins for all sizes available.



New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 231 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the February, 1946, Number of MACHINERY

Gaging Equipment

ABDITE GAUGE Co., 5405 Oakman Blvd., Dearborn, Mich. Pocket-size booklet describing the organization and its line of gaging equipment, and containing gage design standards compiled by the National Bureau of Standards. Copies will be sent to those making requests on their company's business letter-

High-Pressure Die-Casting Machines

HYDRAULIC PRESS MFG. Co., Mount Gilead, Ohio. Bulletin 4402, on allhydraulic high-pressure die-casting machines for magnesium, aluminum, copper, and zinc alloys. Copies available to those requesting them on business stationery.

Carbide Die Service Manual

CARBOLOY COMPANY, INC., 11147 E. Eight Mile Ave., Detroit 32, Mich. Manual D-119 (64 pages), containing complete information on the finishing and servicing of carbide dies for deep drawing and for the production of wire and shaped stock. _

Carbide Milling-Cutter Calculating Chart

Industrial Tool Division, Mount Vernon, Ohio. Chart 99-MC, designed to facilitate the finding of proximate horsepower for carbide and equipment. milling-cutter operation.

Vibration-Absorbing Driving Pad

DRAFTO CORPORATION, Cochranton, Pa. Bulletin describing a new de- lubricating lathe and grinder cenvice known as the "Vibra-Drive," ters, so designed that the lubricant designed to absorb vibration on flows only when the center is in lathes, grinders, or similar machines operation.

in which the work is held between centers.

Electrode Industrial Application

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. Bulletin W8, containing a chart showing the correct Ampco-Trode electrode to use for specific applications in a variety of industries, based on actual case histories.

Bakelite Plastics

BAKELITE CORPORATION, UNIT OF UNION CARBIDE AND CARBON CORPO-RATION, 30 E. 42nd St., New York 17, N. Y. Booklet entitled "Bakelite Plastics-Selecting the Right Thermosetting Molding Materials," containing data supplementary to a new film bearing the same title.

Materials-Handling Equipment

REVOLVATOR Co., 86th St. at Bergen Turnpike, North Bergen, N. J. Bulletin 95 K2, illustrating and describing the Model G Red Giant hand lift-truck. Bulletin 96 D2, descriptive of the Revolvator Model NW portable elevator.

Protective Packaging Film

BETTER FINISHES & COATINGS, COOPER - BESSEMER CORPORATION, INC., Newark, N. J. Catalogue describing the characteristics and applications of "Liquid Envelope," a tough, elastic, impervious film for cutter speeds, table feed, and ap- packaging or protecting materials

Self-Lubricating Lathe Centers

CORRY INSTRUMENT Co., Corry, Pa. (Distributor, Jonglen Co., Erie, Pa.) Circular describing Jonglen self-

Welding Guide

PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE Co., INC., Monessen. Pa. Booklet entitled "Guide to Everyday Welding," containing data of aid in selecting the proper electrode or gas welding wire for various types of work.

Screwdriving Tool

STANDARD PRESSED STEEL Co., Box 22, Jenkintown, Pa. Circular 598, descriptive of the Hallowell Unbrako unit key kit comprising a straight-handle screwdriver, angle wrench, and anvil-handle wrench for driving various types of screws.__10

Electronic Process Timer

PHOTOVOLT CORPORATION, 95 Madison Ave., New York 16, N.Y. Folder descriptive of the Photovolt electronic process timer, an adjustable timing relay with immediate automatic resetting for timing periods from 1/20 second on. ___

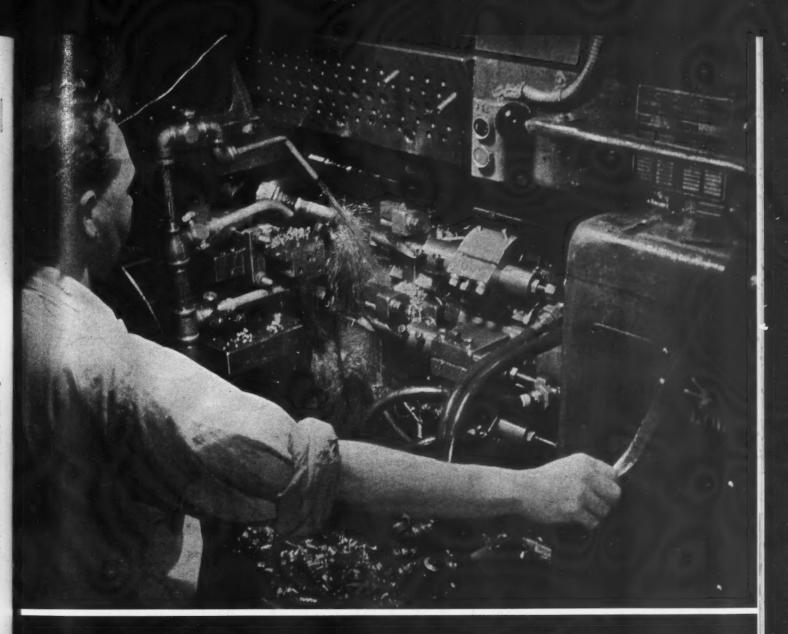
ABART GEAR & MACHINE Co., 4832 W. 16th St., Chicago 50, Ill. Bulletin on spur, bevel, worm, helical, internal, and spiral gears, sprockets, and racks cut to customers' specifications. Speed reducers are also shown.

Special Machinery and Contract Work

THOMAS MACHINE MFG. Co., Pittsburgh 23, Pa. Catalogue illustrating numerous types of special machinery and contract machine work built to customers' designs and specifica-

Electrical Indicating Instruments

MARION ELECTRICAL INSTRUMENT Co., Manchester, N. H. Catalogue illustrating and describing the com-



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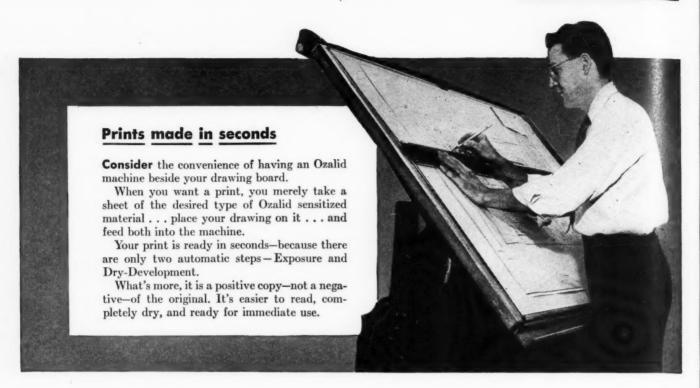
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Sunicut has high lubricating value and is an excellent dispenser of heat. It makes possible heavy cuts at high speed while maintaining accuracy and finish. Call the Sun Cutting Oil Engineer in your territory for full information, or write ...

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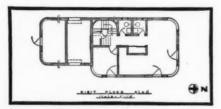
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Bulletin describing a new gage- block utility set which enables me-	Tensile Testing	assembly presses29
chanics to transfer gage-block accu-	W. C. DILLON & Co., INC., 5410 W.	Gear-Finishing Machines
racy directly to work18	Harrison St., Chicago 44, Ill. Bulle-	MICHIGAN TOOL Co., 7171 E. McNichols Road, Detroit 12, Mich.
Air Separator	tin 142, containing data on the tensile, compression, transverse, and	Bulletin 862-45, on the Michigan
SWARTWOUT Co., 18511 Euclid	shear testing of materials and work	Model 862 gear-finisher for spur and
Ave., Cleveland 12, Ohio. Bulletin S-13, describing the "Airfuge," a	pieces 24	helical gears and splines30
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Milling Machines

KEARNEY & TRECKER CORPORA-1H and 2HL milling machines. 32 reciprocating action.

Flexible-Power Press

GENERAL MFG. Co., Detroit 11, describing a new 15-ton flexiblepower press for straightening, bending, forcing, etc.

Printing and Developing Machines

CHARLES BRUNING Co., INC., Chicago, Ill. Catalogue on the Bruning ing and developing machine.

Radiant Heating

SURFACE COMBUSTION CORPORAtypes of heat-treatments.

Abrasive Wheels

NORTON Co., Worcester 6, Mass. ton B-5 resinoid wheel for foundry grinding.

Forgings

KROPP FORGE Co., 5301 W. Roosevelt Road, Chicago 50, Ill. Booklet Catalogue Section 2155, descriptive

Carbide-Tool Grinder

E. F. HAGER & SON, 98-02 217th TION, Milwaukee, Wis. Catalogue Lane, Queens Village 9, N. Y. Bul-H13, containing complete informa- letin 46, illustrating and describing tion on the Kearney & Trecker Nos. a new carbide-tool grinder with

Wheelabrator Swing Table

AMERICAN FOUNDRY EQUIPMENT Mich. Bulletin 381, illustrating and Co., 555 S. Byrkit St., Mishawaka, Catalogue 214, containing Ind. complete information on the new Wheelabrator swing table. _____39

Bright Nickel-Plating

HANSON-VAN WINKLE-MUNNING Co., Matawan, N. J. Set of instructions for operating the cobalt-nickel 75-159B Volumatic high-speed print- plating processes developed by the 34 company.

Electronic Motor Controls

ELECTRON EQUIPMENT CORPORA-TION, Toledo 1, Ohio. Circular SC- TION, 917 Meridian Ave., South 128, describing "Surface" radiant Pasadena, Calif. Bulletin 178, detube heating as applied in various scriptive of "Varitronic" electronic 35 motor drives for industrial use. 41

Flexible Drilling Attachments

GEORGE A. TERRY Co., Buffalo 1, Catalogue describing the new Nor- N. Y. Catalogue 45, describing angle and flexible drilling attachments for 36 hard-to-reach drilling jobs.

Plylock Joints for Rubber Belts

B. F. GOODRICH Co., Akron, Ohio.

Carboloy Tools and Gages

CARBOLOY COMPANY, INC., 11147 E. Eight Mile Ave., Detroit 32, Mich. Catalogue GT-175R, covering the company's line of tools and gages. 44

Stainless Steels

LEBANON STEEL FOUNDRY, Lebanon, Pa. Bulletin on Lebanon straight chromium stainless steels.

Lifting Magnets

ELECTRIC CONTROLLER & MFG. Co., Cleveland 4, Ohio. Bulletin 900, on EC&M lifting magnets. ___

Information on Plastics

In view of the steadily increasing interest in the application of plastics, the Society of the Plastics Industry has made available a pamphlet entitled "Plastics-the Story of an Industry." This little book contains information intended to answer the questions so commonly asked, "What are plastics?", "How are they made?" and "What will they do?". At the end of the book are given a brief outline of the employment opportunities in the industry and a list of the educational facilities available, which should be of special value to returning servicemen. Those interested can obtain copies of the booklet from the Society of the Plastics Industry, 295 Madison Ave., New York 17, N. Y.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 196-226 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below

the identifying number found at the end of each description-or write directly to the manufacturer, mentioning machine as described in February, 1946, MACHINERY.

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To obtain additional information about any of the materials described on pages 194-195, fill in below the identifying number found at the end of each

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I. Survey and analysis of the lubrication requirements of your plant engines and machines.

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Then, too, he will come to you

without a rigid set of rules. Your lubricating procedures are probably based on pretty sound experiences that your own folks have had. Your problem is really one of picking out the weak spots before they become trouble spots...

So call the Shell Lubrication Engineer for that survey. If your property is so large that he needs help, he will have it. You are bound to gain, if it is only peace of mind!

There is no obligation on your part.

Call your local Shell Representative, or write Shell Oil Company, Incorporated, 50 W. 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, California.

SHELL INDUSTRIAL LUBRICANTS



News of the Industry

Illinois, Indiana, and Missouri

C. Q. WRIGHT has returned to the employ of the Whiting Corporation, Harvey, Ill., in the capacity of vice-president dealing with special staff work. Captain Wright, who is a graduate of the United States Naval Academy at Annapolis, served as a submarine commander in the recent war, as well as in World War I. He became connected with the Whiting Corporation in 1939, and was vice-president in charge of sales at the time that he left to rejoin the Navy shortly after Pearl Harbor.

JOHN H. SIPCHEN, 549 W. Washington Blvd., Chicago, Ill., has been appointed representative of the Erie Foundry Co., Erie, Pa., and will undertake the sale of that company's hammers and presses in the Chicago territory. He succeeds the late L. F. Carlton, who had represented the company for about twenty years.

WALTER F. NESSEN has been appointed chief industrial designer for Product Designers, 230 N. Michigan Ave., Chicago, Ill. He was formerly engaged in development and design work for the General Motors Corporation.

B. A. Springer has become a sales engineer for the Baldwin Locomotive Works, Philadelphia 42, Pa. He will be with the Chicago office of the Southwark Division, and will specialize in hydraulic presses.

ROGER F. WAINDLE, formerly manager of industrial sales for the Sapphire Products Division of the Elgin National Watch Co., Aurora, Ill., has been appointed general manager.

CLEO E. GUSTAFSON has been appointed superintendent of the Gary, Ind., plant of the Union Drawn Steel Division, Republic Steel Corporation, Massillon, Ohio. Mr. Gustafson has been assistant superintendent of the Gary plant for the last ten years. He succeeds George E. Yarnold, who has been transferred to the Los Angeles plant recently acquired by the corporation.

FRED M. GILLIES, formerly general superintendent of the Indiana Harbor, Ind., plant of the Inland Steel Co., Chicago 3, Ill., has become works manager of the same plant. A. P. MILLER, who has been assistant to the general superintendent, becomes general superintendent, and A. J. COCHRANE succeeds Mr. Miller as assistant general superintendent.

V. W. Bergenthal has retired as treasurer of the Wagner Electric Corporation, St. Louis, Mo., after forty-one years of service with the organization. He will continue to serve as a director. Mr. Bergenthal started as assistant sales



V. W. Bergenthal, Treasurer of the Wagner Electric Corporation, Who is Retiring after Fortyone Years' Service

manager, and has been treasurer since 1922. He is succeeded as treasurer by J. D. Eby, who will hold the position of secretary-treasurer.

Maryland

RUSTLESS IRON & STEEL CORPORATION, 3400 E. Chase St., Baltimore 13, Md., announces that a merger of the company with the AMERICAN ROLLING MILL Co., Middletown, Ohio, has been effected.

H. D. Moreland has been appointed manager of the X-Ray Division of the Westinghouse Electric Corporation at Baltimore, Md., succeeding A. P. Craig, who is now associated with the Westinghouse Canadian Co.

Michigan

CENTRAL STATES ENGINEERING CORPORArion has been organized at 4612 Woodward Ave., Detroit 1, Mich., to aid manufacturers in designing tools, jigs, dies, fixtures, gages, and special machinery, and in product development. E. M. BEYMA is president and general manager, and John Allmon, vice-president and chief engineer. Mr. Beyma has been vice-president and executive engineer for the last ten years with the Pioneer Engineering & Mfg. Co., while Mr. Allmon has served as assistant chief engineer of that company for the last five years. John S. Bartek is chief designer of the new organization.

CLARENCE L. SMITH has been appointed Detroit district manager for the Grinding Machine Division of the Norton Co.. Worcester, Mass. He succeeds OSCAR A. KNIGHT, who retires after over forty years' service with the company-the major part as Detroit district manager for Norton grinding and lapping machines. Mr. Smith has been with Norton Co. since July, 1923, and for the last seven years has been sales engineer of the Grinding Machine Division, with headquarters at Worcester. Just before the outbreak of the war he spent over a year in Europe on special grinding machine sales engineering work.

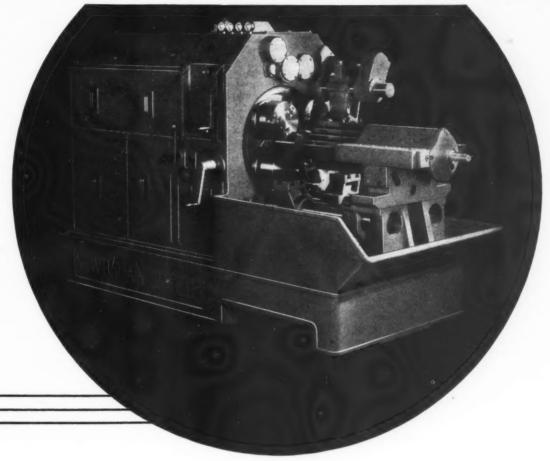


Clarence L. Smith, New Detroit District Manager of the Norton Grinding Machine Division



Oscar A. Knight, Who is Retiring as Norton Detroit Manager after Forty Years with the Company

WIDE OPEN SPACES MEAN QUICK, EASY TOOLING

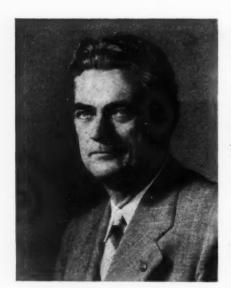


There are many reasons why New Britain stands first in multiple spindle automatic chucking machines . . . but none is more important than its wide open accessibility through open end construction to all tools and chucks, and convenient chip removal. More pieces per hour because no time is wasted reaching for hard-to-get-at points.

New Britain builds a complete line of Multiple Spindle Automatic Chucking Machines...four, six and eight spindles up to 12" capacity. Also a complete line of Multiple Spindle Automatic Screw Machines to $2\frac{1}{4}$ " capacity.

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION



L. Ray Buckendale, New President of the Society of Automotive Engineers

L. RAY BUCKENDALE has been elected president of the Society of Automotive Engineers for the year 1946. Mr. Buckendale, who is engineering vice-president of the Timken-Detroit Axle Co., Detroit, Mich., succeeds James M. Crawford as president of the Society.

Procressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich., has expanded its plant floor space by approximately 50 per cent in order to meet the greatly increased demand for resistance welding equipment for peacetime products. This represents the second major plant expansion in two years. The new facilities include a factory adjacent to the present plant and about 10,000 square feet of new construction.

MICHIGAN TOOL Co., 7171 E. McNichols Road, Detroit 12, Mich., announces that the Cone-Drive Division of the company will hereafter carry in stock standardized cone-drive gear sets in ninety-nine sizes and ratios. The standardized sizes have been developed to facilitate the work of design engineers in selecting the size and ratio of gear best suited to each specific power transmission requirement.

Burke Bartlett has resigned as head of the sales and advertising department of the Eclipse Counterbore Co., Detroit, Mich., to form an industrial advertising agency which will be known as the Burke Bartlett Co. The firm will specialize in tool and equipment accounts. Offices have been established in the Stevenson Bldg., Detroit, Mich.

Logan Miller has been promoted to the position of general superintendent of the Ford Rouge plant, Dearborn, Mich. He has been connected with the company since 1914, when he started as a diemaker in the plant tool-room. During the war, he was superintendent of the Willow Run bomber plant.

DELAVAL STEAM TURBINE Co., Trenton 2, N. J., has appointed the Industrial Equipment Co., 6435 Hamilton Ave., Detroit 2, Mich., sales representative for DeLaval IMO pumps and worm-gears throughout the lower Michigan peninsula.

ABDITE GAUGE Co., Dearborn, Mich., announces a reorganization of the company. Steven Coloske and Arnold Kaiander have become partners of Al Morency. Both Mr. Coloske and Mr. Kaiander were formerly connected with Lincoln Park Industries.

Dow CHEMICAL Co., Midland, Mich., announces that the area of the Washington sales office has been extended to include Virginia, North and South Carolina, Georgia, and Florida.

Minnesota and Washington

INTERNATIONAL NICKEL Co., 67 Wall St., New York 5, N. Y., announces the opening of the Twin Cities Technical Section of the Development and Research Division of the company, in the Northwestern Bank Bldg., 620 Marquette Ave., Minneapolis, Minn. The new section will be under the direction of J. C. NEEMES, JR.

ALLEN-BRADLEY Co., Milwaukee 3, Wis., manufacturer of motor control equipment, announces the appointment of the MUTH-RICHARDS Co., 1426 Broadway, Seattle 22, Wash., as representative in the Seattle area.

New England

EVERETT L. MORGAN has retired as treasurer of the Pratt & Whitney Division of the Niles-Bement-Pond Co., West Hartford, Conn., after forty-eight years of continuous service with the

company, and is succeeded by RICHARD W. BANFIELD. Mr. Morgan was presented with a gold watch by Clayton R. Burt. chairman of the board, at a Christmas Party dinner held at the Hartford Club on December 20. Mr. Banfield became connected with Pratt & Whitney in 1935. He holds the position of secretary and office manager, to which will now he added the duties of treasurer. At the occasion mentioned, four Pratt & Whitney members who had completed fifty years of service with the company were also presented with gold watches. These men are John A. LESNIAK, LEON H. LORD. FRANK A. OBERER, and WILLIAM J. WALCH.

GEOMETRIC TOOL Co., New Haven 15, Conn., announces the appointment of the following distributors: Briggs-Weaver Machinery Co., Dallas, Tex. Well Machinery & Supply Co., Inc., Fort Worth, Tex.; Oliver H. Van Hoen Co. Inc., Houston, Tex.; Alamo Iron Works, San Antonio, Tex.; Dixie Mill Supply Co., New Orleans and Shreveport, La.; L. A. Benson Co., Inc., Baltimore 2, Md.

W. S. MOUNCE, formerly senior metallurgist with the Hamilton Standard Propellers Division, United Aircraft Corporation, East Hartford, Conn., has joined the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York City. He will make his headquarters at the New England Technical Section of the division, 75 Pearl St., Hartford, Conn.

Brass Goods Mfg. Co., 345 Eldert St., Brooklyn 27, N. Y., has purchased a new plant in Deep River, Conn., and will move its business to that locality. The company produces stamped and drawn sheet-metal ferrous and non-ferrous specialties. An office will be maintained in New York City.

CARL M. HELLER has been appointed sales representative for the Corbin Screw



Everett L. Morgan, Retiring Treasurer of Pratt & Whitney Division Niles-Bement-Pond Co.



Richard W. Banfield, New Treasurer of Pratt & Whitney Division Niles-Bement Pond Co.



Division of the American Hardware Corporation, New Britain, Conn., in the territory embracing eastern Massachusetts, Rhode Island, Maine, New Hampshire, and Vermont. RAYMOND M. MALONEY has been appointed northeast sales representative for the company covering contract jobs.

SIZE CONTROL CO., DIVISION OF THE AMERICAN MACHINE & GAGE CO., 4636 W. Fulton St., Chicago, Ill, has established a factory branch at 11 Seneca Place, Greenwich, Conn. The new branch will be under the management of Theodore Breunich.

JOHN S. CHAFEE has joined the Saco-Lowell Shops, of Boston, Mass., and Biddeford, Me., manufacturers of textile machinery, in the capacity of vice-president. Mr. Chafee, who was from 1919 to 1942 with the Brown & Sharpe Mfg. Co., Providence, R. I., served from November, 1942, until October, 1945, on the War Production Board in Washington, most of the time as director of the Tools Division.

RICHARD S. BROWN, Wilbraham, Mass., has been appointed exclusive agent for the NATIONAL BROACH & MACHINE Co., Detroit, Mich., in the area including New England, with the exception of Connecticut. Mr. Brown has been associated with the General Machinery Corporation of Boston for the last three years.

George D. Seguin has been appointed purchasing agent by the Norton Co., Worcester, Mass., succeeding Marcus W. White, who retires after more than thirty-eight years' service. Mr. Seguin has been with Norton Co. for nearly twenty years—for the last fifteen years as assistant purchasing agent.

James F. Collins, Statler Bldg., Boston 16, Mass., has been appointed field engineer and sales representative for the Ajax Flexible Coupling Co., Inc., Westfield, N. Y. Mr. Collins succeeds George C. Ewing, who resigned on account of failing health.

New Jersey

GILBERT L. DANNEHOWER, recently sales manager of the Cosa Corporation, New York City, has established a consulting engineering service known as High Precision Products Co., at Westfield, N. J., which will specialize in highprecision machines, gages, instruments, and methods. It will handle the sale on an exclusive basis in New Jersey, eastern Pennsylvania, Delaware, and the District of Columbia of the products of the Société Genevoise d'Instruments de Physique, Sip jig borers, Maag gear grinders, Bechler automatics, Mikron machines, Studer profile grinders, and Safag gear-hobbing machines.

ROBERT E. CREAMER has returned to the Hanson-Van Winkle-Munning Co.,

Matawan, N. J., after having served as supervisor of plating at the U. S. Naval Air Station, Quonset Point, R. I., during the war period. He has recently completed a training course in Matawan, and is assigned to the New England territory. RICHARD E. WAITE, a new addition to the staff, has also completed a special training course, and is now in the field, with headquarters at Landing Road S., Rochester, N. Y.

FRANK E. NUTT has been made assistant sales manager of the Crocker-Wheeler Electric Mfg. Co., Division of Joshua Hendy Iron Works, Ampere, N. J. He previously served as manager of the company's Washington, D. C., office, and will be replaced in that post by A. M. R. LAWRENCE.

SHERMAN INDUSTRIAL ELECTRONICS Co., 503 Washington Ave., Belleville 9, N. J., was recently incorporated to engage in the manufacture of industrial electronic heating equipment. V. W. SHERMAN is president of the new concern and N. Carver is chief engineer.

James M. Mead, manager of the Philadelphia plant of Joseph T. Ryerson & Son, Inc., has been appointed manager of the Ryerson New York Steel-Service plant at 203 Westside Ave., Jersey City, N. J. He succeeds Harry W. Treleaven, who has resigned.

JAMES C. BARNABY, consulting engineer with the Worthington Pump & Machinery Corporation, Harrison, N. J., has been transferred to the general engineering staff as assistant director of research and development.

HARRY S. AMER has retired after thirty-seven years of service as an incandescent lamp development engineer with the Westinghouse Lamp Division at Bloomfield, N. J.

MURRAY TUBE WORKS, Green Lane, Elizabeth, N. J., has been organized to engage in the custom fabrication of tubular steel. The president of the company is A. J. MURRAY.

New York

COLONEL CLARENCE E. DAVIES, SECRETARY of the American Society of Mechanical Engineers, was awarded, in January, the Legion of Merit for meritorious service while on active duty with the Ordnance Department of the United States Army. He is now resuming his duties with the Society at the national headquarters, 29 W. 39th St., New York City, after an extended leave of absence. As Chief of the Control Division, Office of the Chief of Ordnance, Colonel Davies was concerned with problems of policy, organization, methods, procedures, and statistical reporting practices for the Ordnance Department. He has been with the American Society of Mechanical Engineers since 1920, serving successively as associate editor, managing

editor, assistant secretary, executive secretary, and since 1934, national secretary of the Society.

AIR REDUCTION, 60 E. 42nd St., New York 17, N. Y., announces that work has begun at New Providence (near Summit), N. J., on the construction of a mechanical research laboratory. The new laboratory will have a floor area of 78,000 square feet, and will employ more than 150 engineers, metallurgists, physicists, chemists, and laboratory technicians, as well as a number of instrument-makers and skilled machinists for model-making. Work on the development of processes and apparatus for using industrial gases and the electric arc, particularly in the cutting, welding, and treating of metals, will be carried on at the new laboratory.

CLARK & GEORGE, INC., has set up an experimental and development shop at 10 S. Cottage Ave., Valley Stream, L. I., N. Y., where special machines and manufacturing processes will be developed for manufacturers who have no facilities of their own for such work. HENRY GEORGE, president of the concern, will be in charge of design and development.

Westinghouse Electric International Co., 40 Wall St., New York 5, N. Y., announces the formation of a new service department to aid customers in South America and the Caribbean area with problems of equipment and operation of electrical machinery. J. F. Mann, formerly assistant manager of the industrial apparatus department, is manager of the new department.

T. L. LEE has been appointed district manager of the Agaloy Tubing Co., Springfield, Ohio, for the New Jersey, New York, and New England areas, with offices located at 75 West St., New York City. Mr. Lee was formerly assistant manager of tube sales for Peter A. Frasse, Inc.

W. M. WALWORTH has been elected vice-president and chief engineer of the Mack Mfg. Co., with headquarters in the Empire State Bldg., New York City.

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Ohio

FRED REISER, JR., Cincinnati district manager for the Industrial Division of the Timken Roller Bearing Co., Canton 6, Ohio, since 1944, has been named division manager for all divisions of the company in Cincinnati, including industrial, steel, automotive, and service-sales divisions. HARRY MCCOOL, who joined the company in 1928 as a hot mill operator, has been appointed sales engineer for the Steel and Tube Division in the Cincinnati district, which includes Indiana, Kentucky, and part of Ohio.

FRED ALBRECHT, treasurer and a director of the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, has retired from active service after an association of



The REEVES Motodrive is a complete, totally enclosed, accurate variable speed power plant. It will drive any production machine at infinitely

variable speeds, making available instantly the most efficient speed for every changing condition.

This compact, modern variable speed drive is widely used where space is limited or where direct connection is desirable. An outstanding advantage is that any make, foot type, ball-bearing constant speed motor in standard NEMA dimensions may be specified.

Simple, rugged, dependable, the Motodrive utilizes the time-tested REEVES principle of a V-belt driving

between two pairs of cone-shaped discs which are adjustable to form an infinite number of driving and driven diameters. The transmission of power is accurate at all speeds.

Two space-saving designs—horizontal and vertical—each built in six basic sizes from 1/4 to 15 h.p., covering ratios of speed range from 2:1 through 6:1. By reason of the many different sizes, speed ratios and reduction gear combinations available, you can obtain Reeves Motodrives with output speeds as low as 1.35 r.p.m.; others as high as 3,480 r.p.m. Handwheel control for speed shifting is standard, but Electric Remote is also available. Nation-wide engineering and service facilities. For full information on Motodrive and the two other basic Reeves units—Transmission and Vari-Speed Motor Pulley—write for 96-page catalog M-450.

REEVES PULLEY COMPANY . COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

Accurate Variable
REEVES Speed Control
Gives the Right Speed for Every Job!



Fred Albrecht, Who is Retiring as Treasurer of the Lodge & Shipley Machine Tool Co. after Forty Years' Service

forty years with the company. Mr. Albrecht's retirement is due to ill health. He plans to devote his leisure time to personal avocations. Mr. Albrecht became associated with the Lodge & Shipley Machine Tool Co. in 1906, in the capacity of a stenographer. He was rapidly promoted, becoming successively order clerk, advertising manager, and in 1917, office manager. In 1924, he was appointed sales manager, which position he held until 1928, when be became treasurer of the company and was elected a member of the board of directors.

FEDERAL MACHINE & WELDER Co., Warren, Ohio, has announced the purchase of the Sommer & Adams Co., Cleveland, Ohio, designer and builder of multiple drilling, milling, and tapping machines for the automotive and aviation industries. The company will be operated as a subsidiary of the Federal organization, with headquarters at Warren, but production will continue in the Cleveland factories under practically the same personnel. MALCOLM S. CLARK, president of the Federal Machine & Welder Co., has been elected president of Sommer & Adams.

RELIANCE ELECTRIC & ENGINEERING Co., Cleveland, Ohio, manufacturer of electric motors for the machine tool and other major industries, is erecting a new building beside the company's main plant, which will add 48,000 square feet of floor space and which, with its machinery and equipment, will represent an expenditure of \$350,000.

Precision Welder & Machine Co., formerly located at English and Neave Sts., Cincinnati, Ohio, has purchased a building at 138 S. McMicken Ave., which affords greatly increased floor space. The building contains 25,000 square feet, and is being used for the manufacture of

spot, projection, seam, and flash buttwelding equipment.

HARRIS PRUITT, who was recently released from service with the United States Navy, has returned to the Salem Engineering Co., Salem, Ohio. He previously handled important munitions equipment contracts for the company. Prior to the outbreak of the war, he conducted his own engineering and equipment business.

CECIL C. PECK Co., industrial engineers, 22701 Lake Shore Blvd., Cleveland 17, Ohio, have inaugurated a service for the design of special work-handling fixtures to assist users of the automatic process of shielded metallic arc welding to obtain maximum production.

LEMPCO PRODUCTS, INC., has formed a separate automotive division which is located at 2953 E. 55th St., Cleveland 4, Ohio, to improve service and merchandising of replacement parts. George J. Barsa, who has been with the company for seventeen years, will be general manager of the new division.

H. E. McPherson has been appointed assistant manager of sales of the Republic Steel Corporation's Union Drawn Steel Division, Massillon, Ohio. His association with the company, which began in 1928, was interrupted by thirty-nine months of active duty with the U. S. Army.

AERONAUTICAL PRODUCTS, INC., announces that the company's manufacturing and executive facilities will be consolidated at its plant in Washington Court House, Ohio. An office will be maintained in Detroit to serve customers in that area.

ROBERT M. Zeller, formerly with the Carpenter Steel Co., of Reading, Pa., is now associated with the Aetna-Standard Engineering Co., Youngstown, Ohio. Mr. Zeller is a roll designer, and his capacity in the Roll Sales Division at Aetna-Standard will be that of roll engineer.

ALLEN HURT has joined the Ohio Stainless Steel Co., Cleveland, Ohio, as sales manager. He was previously connected with the Eastern Rolling Mill Co. of Baltimore, Md., now the Eastern Stainless Steel Corporation.

M. J. Anderson has become affiliated with the Aro Equipment Corporation, Bryan, Ohio, in the capacity of sales and service engineer. Mr. Anderson served in the Army Air Forces during the war.

GEORGE E. MILLER has been appointed assistant sales manager of the Machine Division of the Osborn Mfg. Co., Cleveland, Ohio, manufacturer of industrial power brushes and foundry molding machines.

CAL R. Wood has succeeded RALPH D. Lane as purchasing agent for the Aetna Standard Engineering Co., Youngstown, Ohio. Mr. Lane has established a business of his own as manufacturers' agent.

C. H. WAGNER, JR., secretary of the Parker Appliance Co., Cleveland, Chio, has been elected vice-president of the company. He has been connected with the organization since 1941.

Pennsylvania

Philadelphia Gear Works, Inc., Philadelphia, Pa., has appointed Lerot L. Handy, 6932 Cass Ave., Detroit 2, Mich., representative in the Detroit area for all products of the company. The Arwood Machinery Co., 931 Santa Fé Ave., Los Angeles 21, Calif., has been appointed representative in southern Callfornia for all products of the company except Limitorque valve controls.

Dr. Stewart G. Fletcher has been appointed chief research metallurgist for the Latrobe Electric Steel Co., Latrobe, Pa. He will direct an expanded research program which will include all phases of high-speed steel, tool steel, and die steel production. In recent years Dr. Fletcher has conducted special metallurgical research projects as a research associate at the Massachusetts Institute of Technology.

DRAVO CORPORATION, Pittsburgh, Pa., announces the establishment of a new sales department, known as the gear and transmission section of the Machinery Division, to handle the sale of the products of the Worm-Gear Division of the Delayal Steam Turbine Co., Trenton, N. J., and the Brad-Foote Gear Works, Cicero, Ill. The new department will be headed by Henry E. Rea, formerly secretary of the Pittsburgh Gear & Machine Co. Mr. Rea's office will be in the Dravo Bldg., 300 Penn Ave., Pittsburgh 22, Pa.

FRED T. H. YOUNGMAN, formerly executive vice-president of the Jessop Steel Co., Washington, Pa., has been elected president, succeeding R. Edson Emery,



Fred T. H. Youngman, Newly Elected President of the Jessop Steel Co.

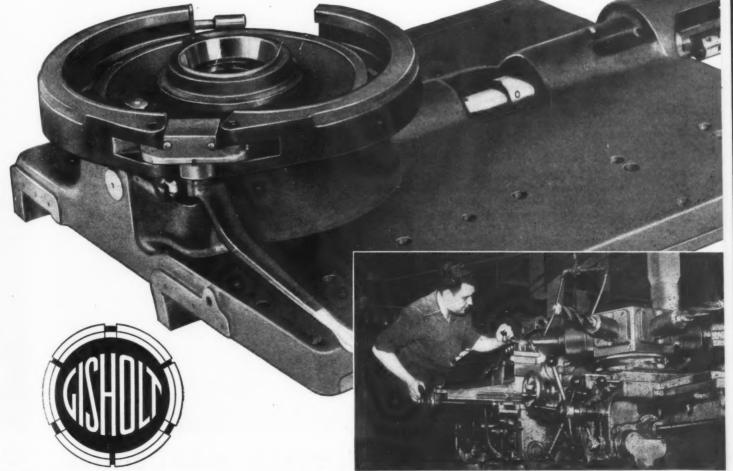
The MOST POWERFUL

Turret Clamp Known
You can't do accurate machining with a tool that

You can't do accurate machining with a tool that chatters. That's why Gisholt takes no chances—why Gisholt provides the most powerful turret clamp found on any turret lathe.

Gisholt's heavy-walled hexagon turret is mounted on a strong, heavy carriage with exceedingly large bearing surface on wide bedways of hardened steel. Long guides for lateral alignment and square lock gib construction assure a snug, rigid mounting at all times. Turret and saddle are flanged to mate with a double bevel steel clamping ring, which is operated by a self-locking cam linkage and long lever. This cam applies very great pressure in the closing of the ring, a mechanical advantage approaching infinity, which assures a tremendously strong and rigid clamping of the turret with extremely light operating effort.

Gisholt's powerful turret clamp is but one of many reasons why you can depend upon Gisholt accuracy now and for years to come.



GISHOLT MACHINE COMPANY

1209 East Washington Avenue • Madison 3, Wisconsin

All features of Gisholt design are aimed at firmly held, smooth-cutting tools to assure greater accuracy and permit the highest possible cutting speeds. Write for literature.

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning



OF CRITICAL PARTS

with Surface-Hardened STAINLESS

No chances can be taken that critical parts will fail in life-saving equipment like this aircraft crash truck. When in operation the nozzle must move freely and easily so that the operator can "sweep" the flaming gasoline away from the trapped flyers with the high-pressure water stream.

Even under the terrific force developed by the high-velocity jet, the bearings in the swivel joints of the nozzle must not bind or seize. And of course there must be no rust or corrosion to impede the smooth action of these bearings.

That is why Samuel Eastman Company installs bearings of Surface-Hardened Stainless Steel in the swivel joints of the nozzle.

With the new Surface-Hardening Process (Malcomizing), it is now possible to take advantage of the inherent strength and corrosion-resistance of stainless steel, and at the same time to get wear-resistant surfaces as hard as 95 Rockwell 15N (73 Rc).

Wherever remarkable ability to stand up under abrasive wear, combined with resistance to heat, corrosion, and oxidation will prevent failure of critical parts, you should consider the Stainless Surface-Hardening Process.

For More Information

If you want to know more about the advantages of this new process and how you can use it, write for the technical bulletin. If you wish, one of our metallurgical engineers will discuss it with you.



STAINLESS SURFACE HARDENING

255 BENT STREET . CAMBRIDGE 41 . MASSACHUSETTS

SUBSIDIARY OF INDUSTRIAL STEELS, INC.

America's Largest Warehouse for Stainless Sheets, Bars, Tubings, Wire, Valves, Fittings, Electrodes and Hardwell

MACHINERY'S DATA SHEETS 555 and 556

DIRECT-CURRENT MOTOR AND GENERATOR "TROUBLE-SHOOTING" CHART-1

Trouble	Cause	Remedy
Motor will not	Open circuit in control	Check control for open starting resistor, open switch, or burned fuse.
	Low terminal voltage	Check voltage with nameplate rating.
	Bearing frozen	Recondition shaft and replace bearing.
	Overload	Reduce load or use larger motor.
	Excessive friction	Check lubrication in bearings to make sure that the oil was replaced after installing motor.
		Disconnect motor from driven machine, and turn motor by hand to see if trouble is in motor.
		Strip and reassemble motor; then check, part by part, for proper location and fit.
		Straighten or replace bent or sprung shaft (machines under 5 H.P.).
Motor stops after running short time	Motor is not getting power	Check voltage at the motor terminals; also fuses, clips, and overload relay.
Motor attempts to start, but	Motor is started with weak or no field	If adjustable-speed motor, check rheostat for correct setting If correct, check condition of rheostat.
		Check field coils for open winding.
		Check wiring for loose or broken connection.
	Motor torque insufficient to drive load	Check line voltage with nameplate rating. Use larger motor or one with suitable characteristic to match load.

MACHINERY'S Data Sheet No. 555, February, 1946

Compiled by the General Electric Co. Schenectady, N. Y.

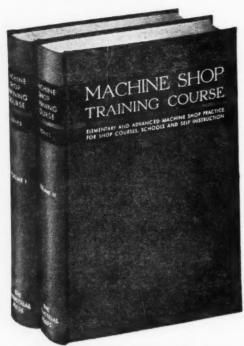
DIRECT-CURRENT MOTOR AND GENERATOR "TROUBLE-SHOOTING" CHART-2

Trouble	Cause	Remedy
Motor runs too slow under load	Line voltage too low Brushes ahead of neutral Overload	Check and remove any excess resistance in supply line, connections, or control. Set brushes on neutral. Check to see that load does not exceed allowable load on motor.
Motor runs too fast under load	Weak field Line voltage too high Brushes back of neutral	Check for resistance in shunt-field circuits. Check for grounds. Correct high-voltage condition. Set brushes on neutral.
	Commutator in bad condition	Clean and reset brushes,
	Eccentric or rough com- mutator	Grind and true commutator, also under-cut mica.
	Excessive vibration	Balance armature.
		Check brushes to make sure they ride freely in the holders.
	Broken or sluggish acting brush-holder spring	Replace spring, and adjust pressure to manufacturer's recommendations.
	Brushes too short	Replace brushes.
	Machine overloaded	Reduce load or install larger motor.
	Short circuit in armature	Check commutator, and remove any metallic particles be tween segments. Check for short between adjacent com- mutator risers.
		Test for internal shorts in armature and repair.

MCo CS-LL

TTS

Machine Shop Training Course



Price \$6 Set—Payable \$2 with Order, \$2 Monthly

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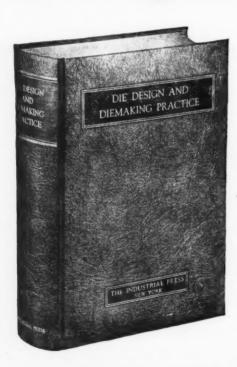
the V

This standard treatise on machine shop practice in two volumes is for the shop man who wants to supplement his own experience with a broad fund of practical knowledge; for use as a textbook and guide in shop training courses; for technical or trade schools; for designers who want the fundamentals of machine shop practice; for mechanical engineering students.

The MACHINE SHOP TRAINING COURSE contains over 1100 pages of questions and answers. These questions deal with the elements of machine shop practice and other subjects closely allied to the work of the shop. The answers are packed with useful facts, shop rules, typical shop problems and their solutions. 524 drawings and photographs illustrate all kinds of machining operations, cutting tools, gages, etc.

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Die Design and Diemaking Practice



If you design, make or use dies for blanking, forming or drawing sheet-metal parts, here is a veritable die designer's and diemaker's bible. This die book presents not only descriptions and drawings of a tremendous variety of dies, but a vast amount of data representing a lot of boiled down and costly die experience. Dies of the same general classes are grouped together in chapters. The drawing dies have been placed into chapters according to the general shapes of the parts produced, to facilitate finding the type of die for producing a given shape. Price \$6—payable if desired \$2 with order and \$2 monthly for two months.

956 pages, 590 illustrations

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

Mr. Youngman has been connected with the company in various capacities for the last twenty-five years.

THOMAS C. FORD has been appointed district manager of the Pittsburgh office of the Electro Metallurgical Sales Cornoration. Unit of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. Mr. Ford was connected with the corporation previous to the war. During the war, he served as chief of the ferro alloys and ores branch of the War Production Board.

LOTT STEFFEY, superintendent of methods and equipment at the Micarta plant of the Westinghouse Electric Corporation at Trafford, Pa., was recently awarded the Order of Merit by the corporation for distinguished service to the electrical industry. This is the highest honor conferred by the corporation on its employes.

GORDON J. BERRY, vice-president of the Electric Products Co., Cleveland, Ohio, has been elected president of the Electric Industrial Truck Association for 1946. F. J. SHEPARD, Jr., treasurer of the Lewis-Shepard Sales Co., Boston, Mass., has been elected vice-president. Headquarters of the Association are at Pittshurgh. Pa

BARWOOD & Co., 3137 N. 15th St., Philadelphia 32, Pa., has been appointed sales representative for the SIZE CONTROL Co.'s line of precision reversible plug gages and the WALSH PRESS & DIE Co.'s line of punch presses. Both companies are divisions of the AMERICAN MACHINE & GAGE Co., 4636 W. Fulton St., Chicago.

FRANK C. KARDEVAN has been appointed assistant manager of sales of Lukenweld, Inc., a division of Lukens Steel Co., Coatesville, Pa. Mr. Kardevan has served with the Lukenweld sales department for four years, and with the combined sales division of Lukens Steel Co. since 1944.

JOHN L. Moser has been appointed abrasive engineer for the Norton Co., Worcester, Mass., in northwestern Pennsylvania and southwestern New York. with headquarters in Erie, Pa. He succeeds R. W. CRAWFORD, who has become president of the Erie Mfg. and Sup-

Ross-N EHAN FOUNDRIES, Chattanooga 1, Tenn announce the appointment of LEE C. WILSON as sales agent in Pennsylvania Maryland, and Delaware, with headquariers in Reading, Pa.

THOMA: B. BLACKWOOD has joined the metallurgical department of the Vanadium-Alloys Steel Co., Latrobe, Pa. Mr. Blackwood was formerly employed by Universal Cyclops Steel Corporation.

DR. ASTHUR H. GROBE has been ap-

who has become chairman of the board. Pa. Dr. Grobe was formerly with the at the age of seventy-two years. Until Metals Research Laboratory of the Carnegie Institute of Technology.

> ROBERT G. ALLEN has been appointed general sales manager of the Baldwin Locomotive Works, Philadelphia, Pa.

Obituaries

C. A. Musselman

C. A. Musselman, chairman of the board of the Chilton Co., publisher of The Iron Age, Automotive Industries, and numerous other business and trade



C. A. Musselman

publications, died on January 3 at the Presbyterian Hospital, Philadelphia, Pa., after a long illness, at the age of seventy-three years.

Mr. Musselman served the organization of which he was the head at the time of his death in many official capacities. He was secretary and treasurer from 1901 until 1923, at which time he became president of the automotive unit. He was elected president of the company in 1934, from which post he retired in June, 1945, to become chairman of the board.

Mr. Musselman was active both in the automotive and publishing fields, and was a member of the Society of Automotive Engineers. He served as president of the Associated Business Papers and was a member of the board of the National Publishers Association. He was very highly thought of, not only in his own organization, but throughout the trade journal publishing field.

E. H. Jones

E. H. Jones, founder and chairman of pointed hief research metallurgist of E. H. Jones (Machine Tools) Ltd., Islthe Vanadium-Alloys Steel Co., Latrobe, ington, England, died late in November

within a few weeks of his death, he was an active director of the company.

Mr. Jones started business in the bicycle industry, and in 1900 he was one of the pioneers in the automobile field. Then he founded the Leeds Tool & Mfg. Co., Ltd., which later became E. H. Jones (Machine Tools) Ltd. In addition to being chairman of this organization, he was, at the time of his death, managing director of C. L. Jones, Ltd., of Wembley, a company founded by his father some sixty years ago. He was also managing director of Engineering Finance Co., Wembley, and of Agricultural Machinery, Ltd., Hendon, as well as a director of A. Wells & Co., London. Formerly, he was also a member of the board of the Meehanite Co. and of Murex Welding Processes, Ltd.

Mr. Jones joined the Machine Tool Trades Association in 1933, and soon after became a member of the Council. In addition, he was a member of the Importers' Section of the Association, and from the beginning of the war just ended until his death he was a member of the Importers' Advisory Panel to the Machine Tool Control.

Mr. Jones has been succeeded on the board of E. H. Jones (Machine Tools) Ltd. by his son, E. J. M. Jones.

Frank S. Warzeski

Frank S. Warzeski, vice-president of The Linde Air Products Co., New York City, died in Montclair, N. J., on December 21, after a short illness, at the age of sixty-one years. Mr. Warzeski was born in Chicago, Ill., in 1884. He received his education at Chicago University and Armour Institute of Technology, graduating from the latter institution with the degree of bachelor of science in chemical engineering. Mr. Warzeski began his association with the Union Carbide and Carbon Corporation in 1912 as an engineer with The Linde Air Products Co. Subsequently he held many engineering and executive positions with other subsidiaries of the corporation. He was successively general superintendent, works manager, and vice-president of the Linde organization. He is survived by his wife and son.

GEORGE BRIDGES, pump application engineer with the Worthington Pump & Machinery Corporation, Harrison, N. J., and connected with that concern for forty years, died on December 19 at his residence in Nutley, N. J. Bridges was born in Holyoke, Mass., and joined the engineering department of the Worthington Holyoke Works in 1907. Since 1934 he had been located at the Harrison plant of the Worthington company, specializing in marine pump applications.

JOHN M. DAVIS, secretary-treasurer of the Kelly Reamer Co., Cleveland, Ohio, died on December 15.

Coming Events

FEBRUARY 1-2—Meeting of the Low-PRESSURE INDUSTRIES DIVISION of the Society of the Plastics Industry, Inc., at Edgewater Beach Hotel, Chicago, Ill. For further information, address the Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y.

FEBRUARY 4-7 — National meeting of the American Welding Society in Cleveland, Ohio; headquarters, Hotel Cleveland. Secretary, Miss M. M. Kelly, 33 W. 39th St., New York City.

FEBRUARY 4-8—METAL CONGRESS AND TWENTY-SEVENTH NATIONAL METAL EXPOSITION at the Public Auditorium, Cleveland, Ohio. Also annual convention of the American Society for Metals in Cleveland; headquarters, Hotel Statler. National secretary, 7301 Euclid Ave., Cleveland 3, Ohio.

FEBRUARY 4-8—National meeting of the Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers in Cleveland, Ohio; headquarters Statler Hotel. Assistant secretary, Frank Sisco, 29 W. 39th St., New York 18, N. Y.

FEBRUARY 13-15—MID-WINTER PERSONNEL CONFERENCE at the Palmer House, Chicago, Ill., under the sponsorship of the American Management Association. Further information can be obtained from the association, 330 W. 42nd St., New York 18, N. Y.

FEBRUARY 25-MARCH 1—Spring meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS to be held at Hotel William Penn, Pittsburgh, Pa. C. L. Warwick, executive secretary, 260 S. Broad St., Philadelphia 2, Pa.

FEBRUARY 25-MARCH 2—Twentieth Exposition of Chemical Industries at Grand Central Palace, New York City. For further information, address Exposition of Chemical Industries, Grand Central Palace, New York 17, N. Y.

MARCH 20-22—Production Show at the Stevens Hotel in Chicago, Ill., sponsored by the Chicago Technical Societies Council. Executive secretary, Paul A. Jonkins, 53 W. Jackson Blvd., Chicago 4, Ill.

MARCH 29-30—AMERICAN GAS ASSOCIATION CONFERENCE ON INDUSTRIAL AND COMMERCIAL GAS at the Commodore Perry Hotel, Toledo, Ohio. For further information, address American Gas Association, 420 Lexington Ave., New York 17, N. Y.

APRIL 1-4 — Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Chattanooga, Tenn. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

APRIL 2-5—PACKAGING EXPOSITION in the Public Auditorium, Atlantic City, N. J., under the auspices of the American Management Association. Further information can be obtained from the American Management Association, 330 W. 42nd St., New York City

APRIL 3-5—National Aeronautical meeting of the Society of Automotive Engineers at the Hotel New Yorker, New York City. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

APRIL 8-12—Annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS, and Exposition under the auspices of the Society, in Cleveland, Ohio. For further information, address executive secretary, Harry E. Conrad, 1666 Penobscot Bldg., Detroit, Mich.

APRIL 22-27—NATIONAL PLASTICS EXPOSITION in Grand Central Palace, New York City, under the sponsorship of the Society of the Plastics Industry, 295 Madison Ave., New York 17, N. Y., who will hold a convention concurrently with the exposition.

JUNE 2-7 — Summer meeting of the Society of Automotive Engineers at French Lick Springs Hotel, French Lick Springs, Ind. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York 18, N. Y.

JUNE 3-6—Aviation Division Meeting of the American Society of Mechanical Engineers at Los Angeles, Calif. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 12-15—Oil and Gas Power meeting of the American Society of Mechanical Engineers at Milwaukee, Wis. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 17-20—Semi-annual meeting of the American Society of Mechanical Engineers at Detroit, Mich. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 20-22—Conference of the NATIONAL INDUSTRIAL ADVERTISERS Association at Atlantic City. For further information, address W. Lane Witt, president and general manager of the National Industrial Advertisers Association, 100 E. Ohio St., Chicago 11, Ill.

JUNE 21-22—Applied Mechanics meeting of the American Society of Mechanical Engineers at Buffalo, N. Y. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 24-28—Forty-ninth annual meeting of the American Society for Testing Materials at the Hotel Statler, Buffalo, N. Y., in conjunction with the seventh exhibit of testing apparatus and related equipment. Additional information can be obtained from C. L. Warwick, executive secretary, 260 S. Broad St., Philadelphia 2, Pa.

SEPTEMBER 16-20 — 1946 Exhibit and conference of the Instrument Society of America in Pittsburgh, Pa.

SEPTEMBER 30-OCTOBER 3 — Fall meeting of the American Society of Mechanical Engineers at Boston, Mass. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

OCTOBER 3-5 — Aeronautic meeting of the Society of Automotive Engineers at the Biltmore Hotel, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York 18, N. Y.

DECEMBER 2-6—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL Ex-GINEERS in New York City. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

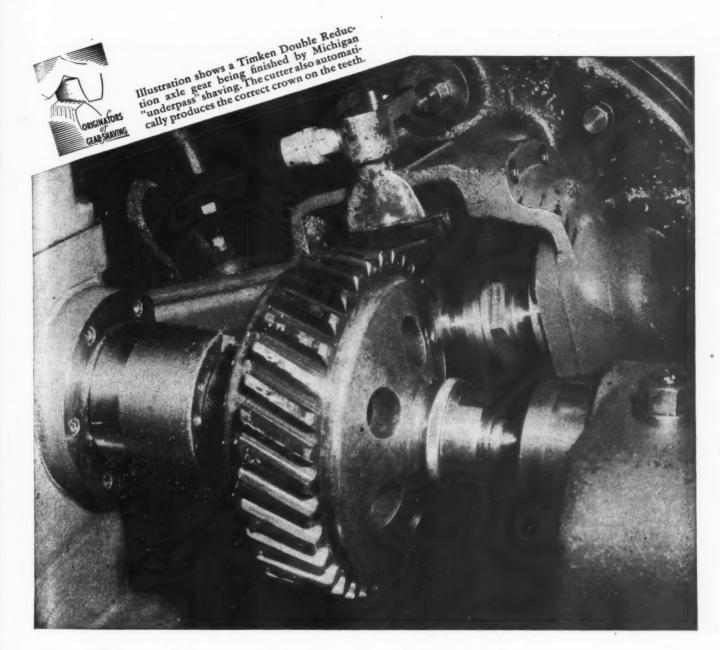
Prizes for Papers on Resistance Welding

Announcement has been made by the Resistance Welder Manufacturers' Association of cash prizes to be awarded this year for outstanding papers dealing with the subject of resistance weld-The total amount of the awards ing. will be \$2000. One prize of \$750 will be given for the best paper emanating from an industrial source, consulting engineer, or private or government laboratory. Papers in these categories should explain the economic importance of the accomplishments described—that is, cost savings, production improvement, scope of application, etc. A prize of \$500 will be given for the second best paper in the same classification, and a prize of \$250 for the third best paper. A \$300 prize will be awarded for the best paper on resistance welding emanating from a university source-from an instructor, student, or research fellowand a prize of \$200 will be given for the second best paper in this category.

The contest is open to anyone in the United States, its possessions, and Canada. It started August 1, 1945, and will close on midnight, July 31, 1946. Papers entered in the contest should be sent to the American Welding Society, 33 W. 39th St., New York 18, N. Y.

Course in Quality Control

An intensive ten-day course in quality control by statistical methods will be given at Purdue University, Lafayette, Ind., February 19 to March 1. The course is designed to train quality control supervisors, managers, industrial engineers, production engineers, design engineers, and persons in charge of specifications in applying modern scientific methods to inspection so as to eliminate variations and control the quality of the product. For further information, address Technical Extension Division, Purdue University.



Underpass Curve Shaving Boosts Gear Production 331/3%

Sure, any kind of gear shaving is fast, but...
According to Wisconsin Axle Division, this Michigan 862 rotary gear finisher is producing 33\%\% more—and more uniform—gears (3\%\%'' to 16\%\%\%'' pitch diameters) with longer cutter life by the use of "underpass" shaving. In addition, where required, the gears are correctly curve-shaved by the shaving cutter at either end of the teeth.

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"Underpass" shaving—exclusive on Michigan gear finishing machines—is the fastest

method of producing the most accurate gears possible. In many cases a single cycle of the cutter—forward and back—is sufficient to finish a gear.

"Underpass" shaving is used interchangeably for both spur and helical gears. It is equally applicable to large as well as small gears—from ½" to many feet in diameter.

For further information on Michigan gear finishing machines to fit your requirements, ask for "Underpass Machine Bulletins."

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New Books and Publications

DRILLS AND DRILLING PRACTICE. 54 pages 8 by 11 inches. Published by the National Automatic Tool Co. Inc., Richmond, Ind. Price, 50 cents.

This book was edited by R. A. Schafer, chief development engineer of the National Automatic Tool Co. The material contained in it is based on many years of experience in the application of drilling practices to manufacturing problems. The sole object of the book is to contribute to the drilling art. It covers types of drills; drilling in general; deep-hole drilling; and drill failure. Specific information is given on cutting speeds and feeds, and design of drills for drilling different classes of materials. One section deals with coolants.

SHOP TERMS. 120 pages, 5 1/2 by 8 1/2 inches. Published by the Syracuse University Press, Syracuse, N. Y. Price. \$1.

This book has been written to meet the need of industrial workers for a reference manual of terms used in the shop. It includes terms encountered in any manufacturing plant where the usual types of machine tools are operated and mechanical and electrical devices are assembled and inspected. Most of the definitions are illustrated. A guide to pronunciation is given in the back of the manual, and a complete set of tables for the calculation of feeds and speeds in milling and turning operations, as well as a four-place table of trigonometric functions, is included.

QUALITY THROUGH STATISTICS. By A. S. Wharton. 60 pages, 5 1/2 by 8 1/2 inches. Distributed in the United States by the Gryphon Press, 301 S. Court House Road, Arlington, Va. Price, \$1.50.

GRAIN SIZES PRODUCED BY RECRYSTALLIZA-TION AND COALESCENCE IN COLD-ROLLED CARTRIDGE BRASS. By Harold L. Walker. 58 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 359 of the Engineering Experiment Station. Price, 70 cents.

Symposium on Magnetic Particle Testing. 130 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia 2, Pa. Price, \$1.25.

Ford Dealers Offer Veterans an "Earn while You Learn" Training Program

More than 9000 World War II veterans are working for Ford Motor Co. dealers under two "earn while you learn" training programs. The majority of these veterans are taking advantage of the automotive mechanics training course. Some, however, are enrolled in the training program intended to qualify them to head dealerships of their own.

During the two-year training course in automotive mechanics, the veteran receives a monthly allotment from the Federal Government, in addition to his wages from the dealer. Veterans accepted for enrollment in the dealership training program become a part of the dealer's organization, and receive experience in all phases of sales and service. The veteran takes his choice between the office and parts departments, and receives full pay during his apprenticeship.

Undergraduate Welding Award

To stimulate undergraduate interest in welding, A. F. Davis of the Lincoin Electric Co., has donated funds for an A. F. Davis Undergraduate Welding Award, which will consist of four cash prizes totaling \$700. These prizes will be presented annually to authors and publications for the best and second best articles on welding published in undergraduate magazines or papers during the preceding year. Any undergraduate of a college, university, or institute of technology in the United States or Canada is eligible, but the paper must be published in an undergraduate publication.

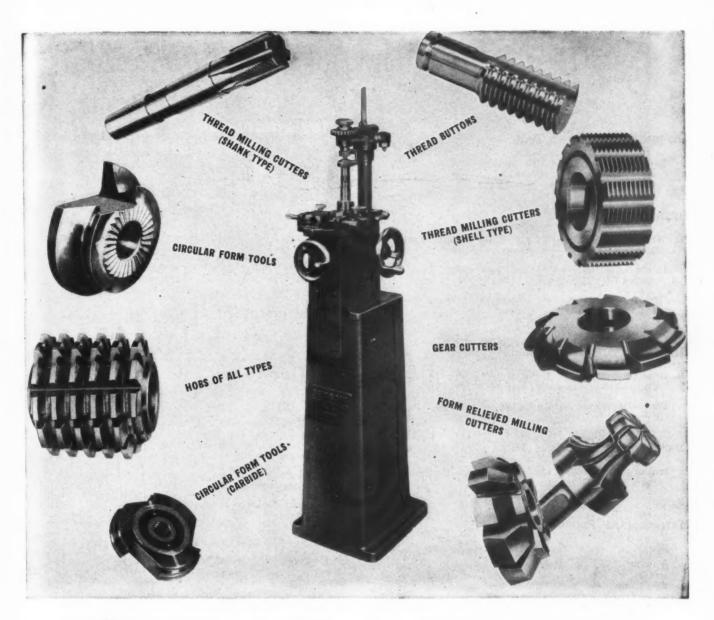
The awards will be as follows: \$200 each to the author of the best paper and to the publication in which it appears, and \$150 each to the author and publication for the second best paper. Judges will be chosen by the educational committee of the American Welding Society, who will select the winning paper in July of each year. The first awards will be made at the next annual meeting of the Society in October, 1946. Further information can be obtained from the American Welding Society, 33 W. 39th St., New York 18, N. Y.

Industrial Strife May Cause Us to "Miss the Boat"

In Trundle Talks, published by the Trundle Engineering Co., Cleveland, Ohio, this little parable is told: Three men stood on the dock, waiting to take the boat to the Promised Land. They got to arguing about which one would get the best stateroom. They argued hard and loud—and while they were arguing, the boat sailed. Are we, too, going to miss the boat because of the lack of good sense on the part of labor, management, and Government?



Characteristic of the family legend in American industry is the Axelson family, owner of the Axelson Mfg. Co., Los Angeles, Calif., manufacturer of heavy-duty lathes and oil-field equipment. Four generations of the family are shown in the illustration, three of the generations being active in the business, with the fourth one "coming along." Reading from right to left are shown Charles F. Axelson, who, together with his brother, Gustavus, founded the business in 1892; Delbert Axelson, son of the founder, who is vice-president of the company; Jack, son of Delbert Axelson, with his son-Stephen Charles—seated on his lap. Charles Axelson, although eighty-one years old, still takes an active part in the management of the business.



You can check all these tools on a DETRISIT HOOK CHECKER

Time consuming and cumbersome positioning of cutters and adjusting of equipment are eliminated on this "Detroit" Universal checker for all types of relieved form cutters. The result is faster and more accurate checking of hook or rake angle and of spacing of gashes or flutes after sharpening.

To check hook or rake all you do is slip the cutter between centers, bring the knife edge against the sharpened face by turning a micrometer until you can't see light between the two. Read the "Mike". The integral flute indexing head makes spacing checking just as simple.

For complete specifications and description of this remarkably simple and effective checker, ask for Bulletin HC-43.

GROUND TAPS & THREAD GAGES

TAP RECONDITIONERS

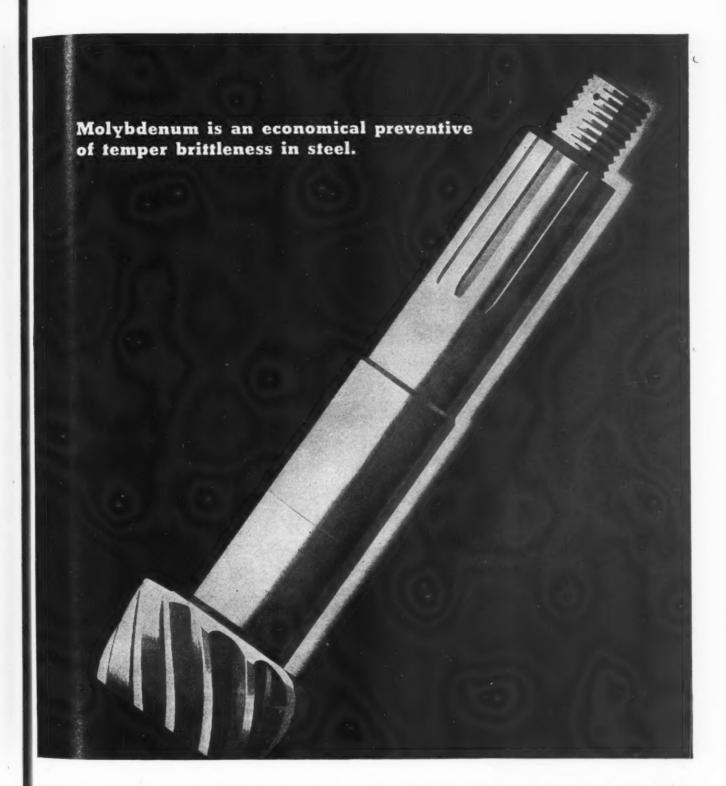


SPECIAL THREADING TOOLS, MACHINES & CHECKERS

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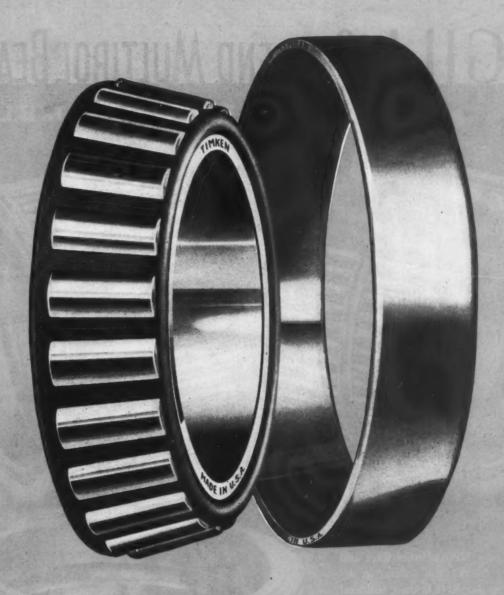


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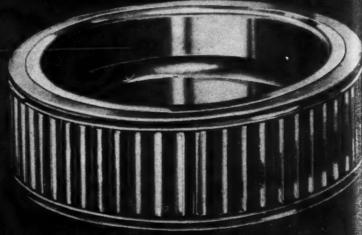
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MCGILL SOLIDEND MULTIROL BEARING

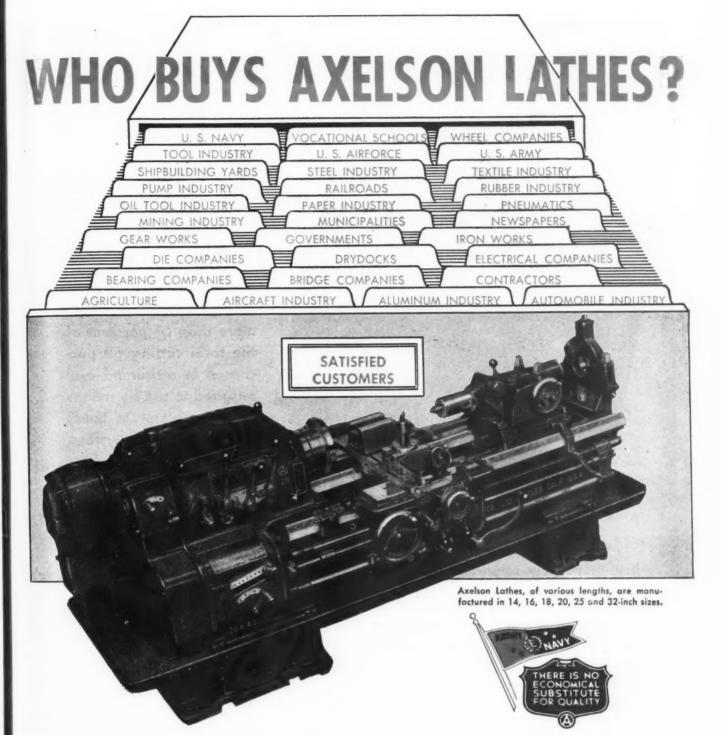
INNER RACE ASSEMBLY



This new McGill Inner Race and Roller Assembly is similar in design to our well known Solidend Multirol Bearing. The inner race and roller assembly is a self-contained unit . . . the rollers cannot drop out. Small radial space is required, and great load-carrying capacity is obtained. Typical application is the constant mesh gears in transmissions. Ask for Bulletin No. I.R-45.



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Axelson Lathes are a blue-ribbon machine tool recognized and used by the major industries of the United States and by Governments and by leading metal turners all over the world... The list of Axelson customers puts on display a parade of great names in light and heavy industry everywhere. The reason for this is simple. The Axelson heavy duty Lathe is exceptional for it reflects thirty years of determination to achieve quality that will stand out in precision, performance and per-piece economy in operation. A great Lathe ready to serve superbly in the bright industrial future.





MACHINERY, February, 1946-255

ave more than the oil ...



At the Parker Appliance Company, Cleveland, more than 61 per cent of the total cutting oil purchased is reclaimed and returned to use by means of a complete De Laval Oil Reclamation System.

IMPURITIES and water are instantaneously removed and the oil can be used over and over again when factory oils are purified by means of a De Laval Oil Purifier. This is in itself a sufficiently profitable reason for purifying factory oils by means of De Laval centrifugals.

Equally important is the effect on tools and on the work. Purification of cutting oil, for example, greatly prolongs the life of the cutting tool; it reduces machine "down time" and insures more consistently accurate work.

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THE DE LAVAL COMPANY, Limited MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

DELAVA CUTTING OIL RECLAMATION SYSTEM

Mahon Fabricated Fabricated NELDMENTS

... a Plus Value in APPEARANCE

Mahon design engineers and the Mahon plant—modern though it is in every respect—with every facility to insure precision in fabrication and thoroughness in treating and inspection, are not alone responsible for the finished appearance of massive weldments such as the one illustrated here . . . the technique and skill of Mahon craftsmen shows up and speaks volumes in the finished product. This is a plus value of which the Mahon organization is justly proud, and are pleased to pass along to you.

Address Inquiries to STEEL PLATE DIVISION

THE R. C. MAHON COMPANY Home Office and Plant, Detroit 11, Michigan Western Sales Division, Chicago 4, Illinois

> Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products.

Manufacture Harman

MACHINERY, February, 1946-257



use of Veelos V-belt provided the following engineering advantages: 1. Eliminated overhead motor and overhead belt drive. 2. Provided better speed control...old drives had only one speed forward and return. 3. Ended noise and excessive vibration.

THEN the Krautter-Weber Tool Works, Newark, N. J., decided to modernize this heavy duty shaper-built many years ago -it specified Veelos link V-belt on four vital drives. Efficient speed control was a "must" - and, in selecting Veelos, Krautter-Weber chose the belt that helps hold machine speeds at desired rates by providing uniform belt tension and by eliminating belt slippage:

1. Veelos Provides Uniform Belt Tension: Veelos patented link construction permits easy adjustment so that each strand of a multiple V-drive carries its exact share of the load. All strands constantly work

together, delivering full power.

2. Veelos Ends Slippage: Quick, easy adjustment of Veelos ends belt slippage . . . keeps machinery running at full speed and assures full productivity.

To modernize old equipment... to assure maximum service on new equipment . . . to replace V-helts on any equipment . . . specify Veelos. A Veelos engineer will gladly assist you-just write and arrange an interview.

MANHEIM MANUFACTURING & BELTING COMPANY MANHEIM, PA.

Adjustable to any Length Adaptable to any Drive LINK CONSTRUCTION UPS PRODUCTION

For METAL CUTTING



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STARRETT STANDARD Flexible Back, All Hard or "Semi-Flex".

STARRETT "S-M" MOLYBDENUM specially tempered for high speed cutting of hard metals.

STARRETT 18-4-1 TUNGSTEN High Speed Steel for cutting the complete range of hard-to-cut metals.

THE NEW STARRETT "SAFE-FLEX", a high speed steel blade with flexible back and hard edge, making it virtually unbreakable on the toughest jobs.

By MACHINE

STARRETT "S-M" MOLYB-DENUM have a remarkable record of performance and low cost per cut.

STARRETT HIGH SPEED STEEL 18-4-1 Tungsten all hard blades for light and heavy sawing of high alloy metals, stainless steel, phosphor bronze, tool steels, chrome steel, monel, etc.

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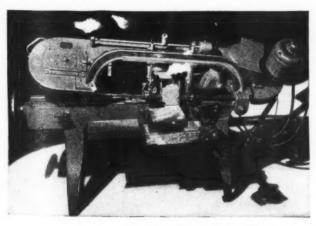
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Buy STARRETT Hacksaws



and METAL cutting Band Saws

STARRETT BAND SAWS with hard edge and flexible back, available in 9 widths, 3 gages and 8 pitches, in coils of any desired length, or cut to length and welded ready to use.

STARRETT "SKIP-TOOTH" METAL CUTTING BAND SAWS for fast cutting of magnesium, aluminum, bronze, soft brass and other non-ferrous metals; also for special compositions, fibre, bakelite, plastics and wood.

For a complete guide to buying and using metal cutting HACK SAWS and BAND SAWS, write for Starrett Saw Booklet "D".

THE L. S. STARRETT CO. · ATHOL · MASSACHUSETTS · U. S. A.

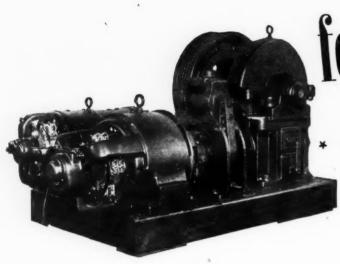
World's Greatest Toolmakers

STARRETT

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Otis Maintenance





for Otis Elevators

Otis Maintenance is a service under which the owners of Otis elevators place the entire care of their elevator equipment in the hands of the manufacturer.

This service by Otis for Otis elevators cannot be duplicated at any price. There are three reasons for this:

Men — a field and headquarters organization combining the knowledge and experience of trained elevator men with that of those who designed and built the equipment.

Materials — including genuine Otis parts, special Otis tools, and over a million dollars worth of emergency replacement equipment.

Maintenance Methods — the result of periodic inspections, lubrication, adjustment and replacement of parts, supported by scientific study and research to make elevators run better and last longer . . . a clinic that, in one day,

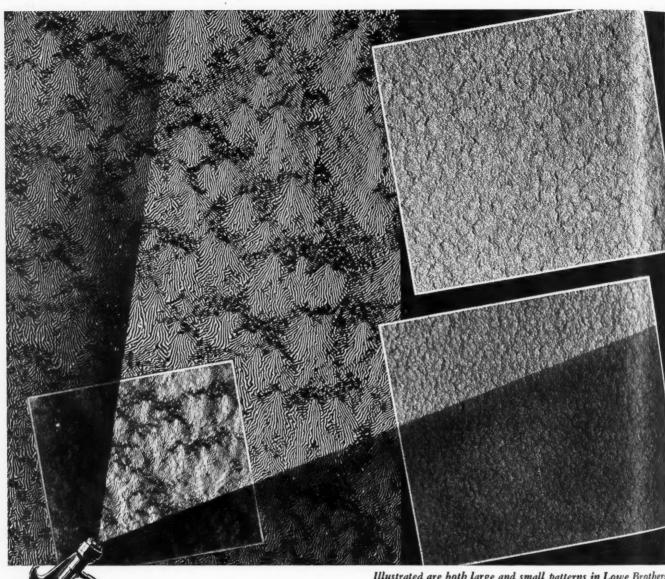
gains experience that would take the average owner over fifty years to accumulate.

Under Otis Maintenance the world's greatest store of elevator knowledge and experience is combined with the facilities of the manufacturer of more than half of the world's elevator equipment.

You can obtain this service for your elevators at a flat monthly rate. Complete details are available through local Otis Elevator Company offices.







Illustrated are both large and small patterns in Lowe Brothers Veltex Pine Tree Wrinkle and Veltex Uniform Wrinkle

Improved Veltex Wrinkle Finishes by Lowe Brothers are Versatile and Economical

Recent developments and improvements in Lowe Brothers Veltex Wrinkle Finishes have increased their versatility and made them first choice for a wide variety of attractive and economical finishing purposes.

For example, the baking time of Lowe Brothers Veltex Pine Tree Wrinkle has been reduced by one-third. This results in greatly stepped-up finishing production.

Another outstanding characteristic of Veltex Pine Tree Wrinkle is its unusual receptivity to coating with Lacquer or Synthetic Bronzing Liquid.

Today, as a result of these continuous developments, Lowe Brothers improved Veltex Wrinkle Finishes are available in almost any color for a wide variety of applications. They can be baked from 10 to 60 minutes at temperatures ranging from 250° to 325°. Baking systems may be either infra-red or conventional baking

ovens. Finishes may vary from dull to medium high gloss.

Without obligation, let us show you how one of these versatile and economical Wrinkle Finishes can solve your finishing problem.

THE LOWE BROTHERS COMPANY
DAYTON, OHIO

Lowe Brothers
FINISHES for Industry

262-Machinery, February, 1946

We Asked Several Hundred Users:

"What Do You Like Most About **GEMCO Shapers?**

> Here Are the 10 Most Popular Features and Advantages:

- "Rugged, rigid and accurate, giving work a precision finish."
- "Lubrigard Safety Device."

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- "Wide range of feeds and speeds; saves time and tools."
- "Power rapid traverse a time saver."
 - "Our operators and tool-makers enthusiastic in general."
 - "Universal table is big, useful, time-saving."
 - "Quiet, smooth-running, easily adjusted, easy to operate."
 - "Centralized Controls."
 - "No breakdowns, small maintenance cost."
 - "Time-saving, resulting in lower production costs."

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Mountain your metal

Here's the fast, modern method of cutting steel to any shape, practically any size, and in most any quantity. These speedy, metal-cutting tools bring new economy and flexibility to all steel-cutting operations . . . from squaring and shaping of large plates and heavy slabs to quantity-cutting of small steel parts.

Made in a wide range of types and sizes, Airco Gas Cutting Machines are designed to meet the needs of industry from the smallest metal shops to the largest steel fabrication plants. Each Airco machine performs a wide variety of cutting jobs within its specific operating range. There is almost no limit to the thickness of steel which may be cut, and all standard plate thicknesses are well within the range of Airco machines.

Airco Gas Cutting Machines are made in portable and stationary types, designed for single and multiple torch operation. Their rugged construction and excellent operating characteristics give them long, trouble-free life, even under heavy service loads.

Call or write your local Airco office today for free copies of descriptive booklets on Airco Gas Cutting Machines or, if you prefer, address your request Dept. M, Air Reduction, General Offices: 60 East 42nd St., New York 17, N. Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

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Represented internationally by Airco Export Corp.

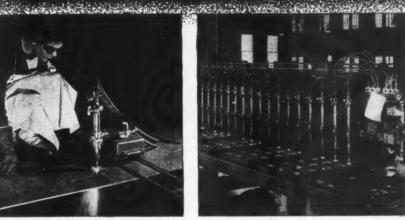


al cutting methods with

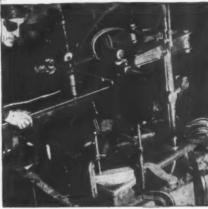
AIRCO GAS CUTTING MACHINES ...A TYPE AND SIZE FOR EVERY CUTTING NEED



Squaring, beveling and many similar cutting jobs are performed swiftly and accurately by the Airco No. 10 Radiagraph. Lightweight and portable, this little motor-driven machine also cuts arcs and circles up to 85" in diameter.



Large-area cutting and quantity production of small parts is speeded by the Airco No. 41 Travograph, a motor-driven machine which moves on a track located alongside the work. Multiple cutting torches are guided by a tracing device which follows a cam or template of the required shape.



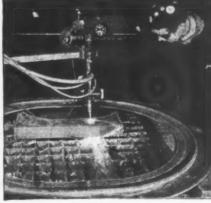
Stack cutting small parts with the Airco Planagraph. Identical parts of any design are accurately shaped in one operation by ing" the plates to any thickness within range of the cutting torch.



Pipe cutting and beveling simultaneously with the portable Airco No. 1 Pipe Cutting and Beveling Machine. This handy machine requires no power. It is, operated by a crank which revolves the machine around the pipe. If desired, the machine may be held stationary while the pipe is revolved.



For fast cutting of small shapes the Airco No. 5 Camograph is ideal. It cuts parts of any contour by means of a motor-driven template roller which follows a metal template of the required shape. This in turn controls movement of the torch, and assures speedy, accurate



Continuous, curved bevel cuts and special symmetrical shapes are made with the Airco 10 Polygraph, a motor-driven machine that travels on a track which is also the template for the cut. The Polygraph is one of many Airco machines designed for special cutting operations.





Versatile ... a Size for Every Application!

The Morflex is an all-purpose coupling for installations, large or small, has a range of sizes with capacities from 8 foot-pounds to 725 foot-pounds torque.

Morflex couplings, driving thru Neoprene biscuits, eliminate all contact between metal surfaces. With their inherent flexibility they reduce bearing wear, permit slight angular misalignment, ease thrust and torsional loads, isolate shock and vibratory impulses.

Engineered for tough, dependable service, they require no lubrication and are sealed against the effect of dirt, dust and weather.

Ask for more information. Call the Morse engineer or write Morflex Department, Detroit.



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CLUTCHES

MORSE Roller CHAINS

MORSE CHAIN COMPANY . ITHACA, N.Y. . DETROIT 8, MICH. . A BORG-WARNER INDUSTRY

Wickes Automatic Center Drive

Crankshaft Lathes

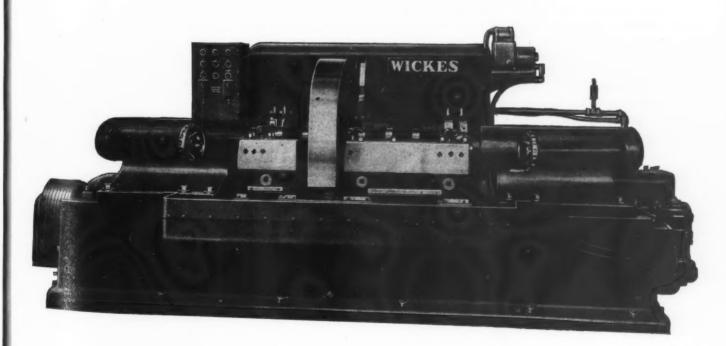




When production is small, one lathe may be provided with several sets of tooling, arranged for machining different sizes and types of cranks.

Usually, a duplicate lathe is used for finish-turning and filleting of main line bearings and for the finish-turning of both ends of the crankshaft. This operation is performed immediately after the roughing operation in the Roughing Lathe and thus replaces rough grinding and saves considerable labor and cost.

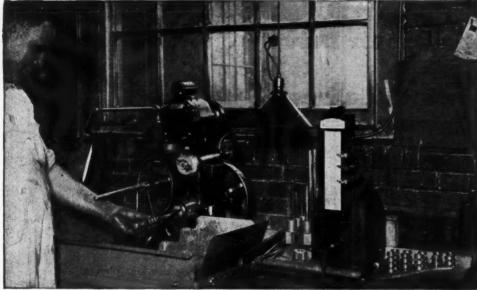
Write for more complete information about Wickes Center Drive Lathes.



Wickes Lathes CUT COSTS - SPEED PRODUCTION

WICKES BROTHERS . SAGINAW, MICHIGAN . RECOGNIZED QUALITY SINCE 1854

Crankshaft Turning Equipment * Camshaft Turning Equipment * Double End Boring Lathes * Heavy Duty Engine Lathes * Special Production Lathes * Blue Print Machines



Pickering Governors, such as the one shown here, control the speed of prime movers within 1/100 of 1 per cent, thus accuracy is an absolute essential.



Tolerance .00007" with Sunnen Precision Honing Plus Selective Fitting!

"he Pickering Governor Company had an internal finishing job that couldn't be handled economically by conventional internal finishing methods. The hole diameter was too small in proportion to its length to allow accurate finishes — until they started using the "MA" Precision Honing Machine.

These parts are machine reamed to .003" undersize; then sized and finished on the Sunnen Precision Honing Machine to a tolerance of .000125". When inspected, the parts are marked whether plus or minus, and the mating parts are similarly marked. The result is a final operating clearance on most parts within .00007" of the specified value. The maximum possible variation is .000125".

This experience is not an isolated instance. Hundreds of Sunnen Precision Honing Machines are doing similar jobs in war plants today and will be quickly and easily converted to peace-time production.

Let a Sunnen engineer come in to give you complete details on how this machine can be used on your jobs - or write for a free bulletin.

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Typical Jobs





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Aircraft Valve Tap-pet Roller. Honed after grinding to give 100% bearing



Aircraft Carbureter Operating Valve Sleeve. Sunnen hon-ing eliminates dis-



Hydraulic Control Bushing, Honing gives straight round hole after rough reaming.



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The SUNNEN **Precision Honing** Machine

- Hones and finishes internal cylindrical surfaces from .185" to 2.625"
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- Produces a super-smooth finish of 2 to 3 micro-inches
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- Does not require skilled labor
- Can be "set up" for any size in one
- Economical to operate



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TYPICAL USES FOR Solvent "26"



CARBURETORS
—Solvent "26"
removes gum, gasolene sediment
and other accumulations of dirt.



SPARK PLUGS— Solvent "26" safely cleans porcelain; helps loosen carbon deposits.



METAL PLATES AND SCREENS— Solvent "26" restores clear, clean finish to any metal surface.



DIES AND STAMP-ING—Solvent "26" removes drawing compounds from dieformed or stamped metal.



LABORATORY
EQUIPMENT—
Solvent "26"
frees glass and
metal tubing and
their supports of
gums, varnishes
and other incrustations or deposits.



PISTONS—Removes lacquers, gums, resins, etc. from gas, gasolene and diesel engine pistons and rings. Also effective for cleaning all parts ed motors, engines

of dismantled motors, engines and machinery.

REMOVES :

Oil · Grease · Gums · Varnishes · Lacquers · Paints
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The fast action of Solvent "26" reduces cleaning time from hours to minutes on dismantled engine parts and all kinds of machinery. Simply dip, rub, brush or spray it on. Then flush clean with hot water.

Mail the coupon today for literature and information leading to a demonstration of this unique product in your own plant.

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Gentlemen: I am interested in a demonstration of Solvent "26"—at no cost or obligation.

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MACHINERY, February, 1946-269

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From here on, you can get exactly what you want to adapt the machine to YOUR specific needs. The advantage is that the larger part of the machine is STANDARD with the resultant economy of a standard chassis; the equipment may be either special or standard with automatically indexed 6-position turret or a plain saddle with single tool post. Lever feed

or screw feed cross slides can be furnished also.

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Any way you look at this "basic machine proposition" it spells ECONOMY and EFFICIENCY in capital letters. Optional Worm Drive or Direct Drive and optional 4-speed or 2-speed motor in the basic machine give you still wider selectivity. If seriously interested, write . . .

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Pressure—when you want it, where you want it—as you want it—that's what you get from Elmes forcing presses.

Multiple rows of piston rings seal in the power, never need replacing. Elmes presses are always ready. The many types and sizes—vertical, horizontal, inclined, portable—serve every pressing purpose. Elmes positive control makes operation fast, accurate—stops costly spoilage.

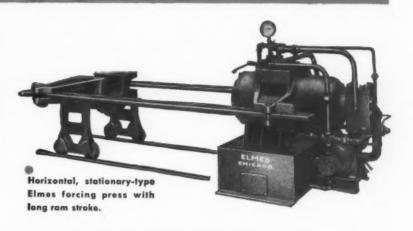
Jobs Like These

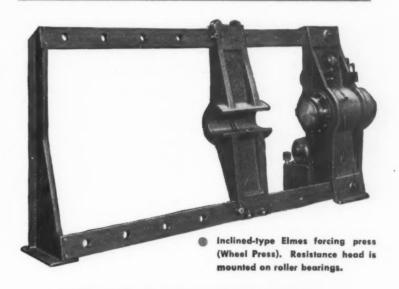
In railroad shops, and wherever heavy assembly or repairs call for power to produce, Elmes smooth dependability makes difficult tasks routine. For pressing wheels or gears on or off shafts, for inserting and removing bushings, and for other force fits and forcing work, Elmes speed and versatility save valuable time.

Instant Control

All Elmes forcing presses are quickly adjustable to piece size and service needs. Sizes range up to 600 tons, and larger, in self-contained and accumulator-operated types with rapid traverse plungers. Speed and pressure are *instantly responsive* to operator control. Portable and handpowered models to 300 tons.

Whatever the requirements, there are dependable Elmes presses that meet your needs exactly. Ask us for Bulletin 1055. Distributors in principal industrial centers.







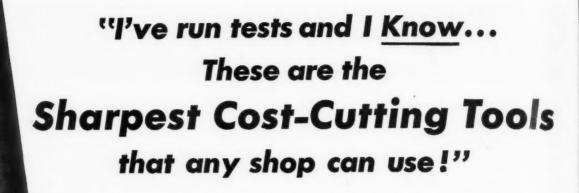
For Piece or Production Work Wherever Force Is Needed

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ELMES ENGINEERING WORKS of AMERICAN STEEL FOUNDRIES • 222 N. Morgan St., Chicago 7, Ill.

Also Manufactured in Canada

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES



Comparative tests of American Phillips Screws with any other type prove: American Phillips Screws always cost less to use. Here are some of the reasons:

Easier Handling: 4-winged driver fits firm and straight into tapered recess in screw-head.:: can't twist out. Spiral and power drivers are safe to use on all jobs. No fumbling, false starts or dropped screws.

Fast, Straight Driving: Screw and driver align automatically into one straight driving unit. Starting is faster. Driving is easier. And screws are turned up tight and flush the first time, every time.

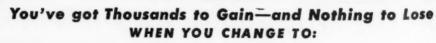
Cleaner Fastenings... Unmarred Work: No crookedly driven screws, no split or burred screw heads. And because the driver can't twist out, there are no slashes on work-surfaces, no injuries to workers.

IN SUM: American Phillips Screws save an average of 50% in assembly time.

Today, with assembly costs increased and threatening to go higher, the time saved through the use of American Phillips Screws becomes doubly important. And you get a further saving, too, from American's 4-phase inspection, which gives you a higher "perfection-percentage" in every order for American Phillips Screws and Bolts. So start action today, to cut costs the American way.

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Chicago 11: 589 E. Illinois Street Detroit 2: 502 Stephenson Building



AMERICAN PHILLIPS Screws

igidity, precision and endurance under heavy loads are attributes of Bunting Cast Bronze Bearings. The oil film insulates against noise and wear. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.

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Now—when you are sweating out production to catch up with peacetime demand—when every shut-down means lost marketing opportunity as well as costly labor and machines standing idle—give Rollway right-angle loading a chance to prove what it can do for you in the way of preventive maintenance.

Rollway Right-Angle Roller Bearings will help your machines to run longer under heavier loads . . . with lower maintenance cost . . . and low bearing-replacement costs. That's because Rollway right-angle loading splits all compound loads into the two simple components of pure radial and pure thrust . . . carries each of these components on a separate bearing assembly at right angles to the roller axis. It reduces the unit loading on rollers and bearings. Insures lower starting and running torque. Eliminates all resultants from oblique loads, all piling up of thrust and radial loads on the same bearings. That's why you get longer periods of precision operation, with fewer shut-downs for service or replacement.

Send us a print or detailed description of your bearing needs for free bearing analysis and recommendation. No charge. No obligation. S.A.E., and American Standard metric dimensions and tolerances are available for most applications, assuring quick supply and low replacement costs.

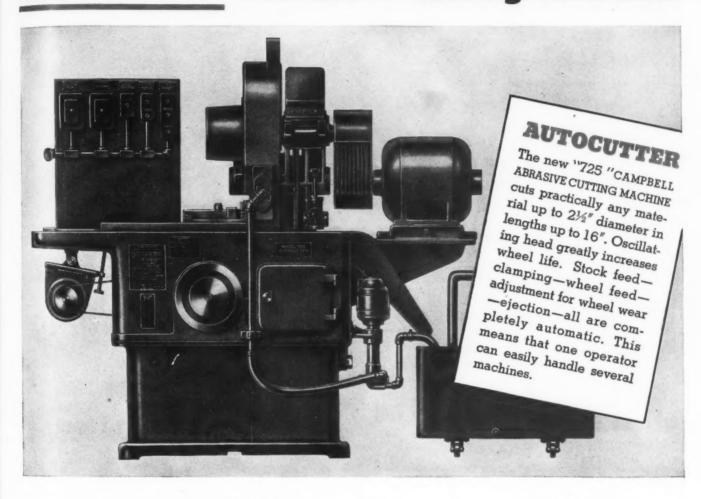
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AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.



HOLO-KROME Fibro forged SOCKET SCREWS

Method patented, owned, controlled, exclusively used by Holo-Krome.



A stronger screw! Continuous fibrous structure, uninterrupted, unbroken, unsevered in Socket Screws means only one thing—Holo-Krome FIBRO FORGED Screws. The method, patented and used exclusively by Holo-Krome, inherently has this continuous fibrous structure plus the increased strength imparted by the Holo-Krome method of Completely Cold Forging . . . Specify "Holo-Krome" and benefit by Completely Cold Forging — a stronger Socket Screw!

Shown above—Etched, cutaway view of a H-K Socket Head Cap Screw. Notice the Continuous Fibres running from end to end!

THE HOLO-KROME SCREW CORP. HARTFORD 10, CONN. U.S.A.





Ways to do tt

AIR TOOLS
COMPRESSORS
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ROCK DRILLS
TURBO BLOWERS
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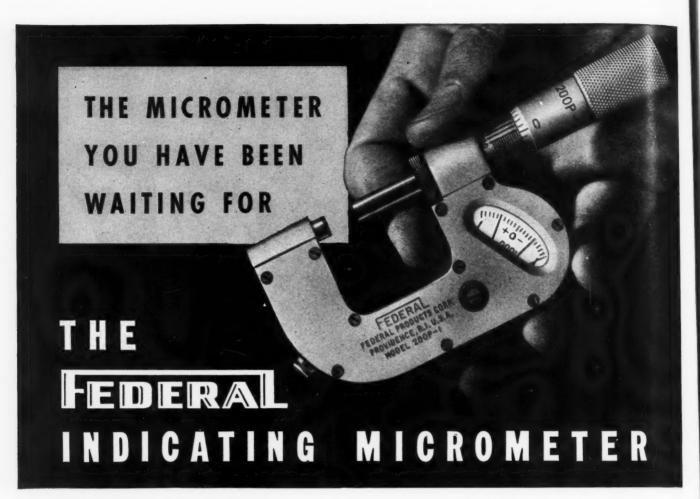
By fast we mean the air tool has the job finished in the shortest possible time. This, of course, requires the cooperation of the operator, but that is obtained easily because air tools are lightweight—less fatiguing—safe—increase his capacity and ability to do better work.

The speed and torque of air-motor tools can be varied at will. They can be started and stopped instantly, permitting quick spotting on repetitive operations.

Durability is another factor not to be overlooked when doing jobs faster. The simple sturdy design of I-R air tools assures "stick-on-the-job" performance as well as low maintenance costs.

When you need portable, hand-held tools, be sure to get I-R Air Tools.

Ingersoll-Rand





USED AS A MICROMETER — spindle is brought into contact until Indicator reads "O".



USED AS A GAGE — push button retracts anvil and dimension is checked on dial.

... Has Many Advantages Over Usual Type Micrometers

This new Federal Indicating Micrometer combines the precision of the Dial Indicator for uniformity of contact pressure and for use as a comparator, with the accuracy of the micrometer thread for measuring.

You do not need the skill of a toolmaker to operate it accurately. The Dial Indicator insures uniform contact pressure.

It takes the place of a complete set of "go and no-go" gages, because you can set it to the required size, clamp it in that position, and gage your batch of workpieces.

Anvil is retractable. Both contacts are Tungsten Carbide tipped. It is light, easy to handle, and much easier to read.

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For instruction and training. Loaned on request.

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MECHANICAL AIR and ELECTRONIC GAGES

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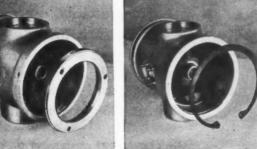
MEASURING

INSTRUMENTS



BEFORE TRUARC-

High centrifugal loads generated by whirling blades of automatic variable pitch propellers were borne by a buttress-threaded nut screwed into the hub. This meant expensive machining, extra weight.

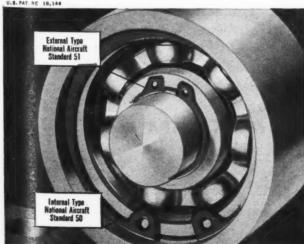


AEROMATIC AIRCRAFT PROPELLERS are standard equipment on the Rocket 185, illustrated above.

AFTER TRUARC-

Elimination of conventional nut greatly reduced weight—cut machining time and cost 75%—made over all maintenance easier. Truarc retention strength against tons of centrifugal force is 3 times greater than operating load.

U.S. PAT. RE 18,144



Waldes Truarc Retaining Rings are used to save weight, space, cost and time in a wide range of products. For holding and positioning machine parts they offer definite advantages over nuts, shoulders, collars and pins. They simplify and speed up production. They can be put on and taken off again and againand still retain the perfect circularity which gives them their never-failing grip. Test them yourself. We'll furnish samples and complete data. Write Dept. 0-2.

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MACHINERY, February, 1946-279



Schatz "Commercial" ball bearings are strong and rugged, — built to give long, lasting service under any conditions.

"Commercials" are moderately priced...the best ball bearing value on the market.

You can get "Commercials" in standard types and sizes, or we will make them to your B. P. specifications.

The next time you buy ball bearings . . . specify "Commercials". . . made by Schatz, one of the Pioneers in the ball bearing industry.



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IN Sier-Bath screw pumps... Close Centers and High Torque Load





Mhether they are taking punishment inside a pump or diesel engine, or maintain-

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Give your equipment the smooth, compact, anti-friction protection of Orange Roller Bushings. Available in a full range of sizes and types for most requirements. Send for Engineering Data Book showing design, sizes, capacities, installation data, etc.

ORANGE ROLLER BEARING CO., INC. 1

Sier-Bath Screw Pumps handle thick fluids and semisolids at 1150 and 870 r.p.m. To withstand this high torque with close centers in the quadruple screws, required bearings of small o.d. and high load carrying capacity. Orange Roller Bushings were selected and are serving with great satisfaction on another tough job.

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Please send me your Roller Bushing Data Book

Company...

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CAN BE INSTANTLY DISASSEMBLED FOR INSPECTION AND CLEANING

Federal Separable Type Magneto Bearing has many advantages. Separable construction affords quicker unit assembly. The bearing can be assembled and adjusted manually, or automatically by springs to eliminate internal looseness. Another noteworthy feature is the bronze high-speed retainer which is of one piece channel construction, perfectly balanced, operating with minimum internal friction.

This efficient Federal ball bearing is used principally in grinding quills, vacuum cleaners and Selsyn motors.

Federal offers complete ball bearing coverage,—fine ball bearings of various types for industrial, automotive, aircraft and marine service. For precision performance, use Federals in your plant, or product.



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The Kropp engineering representative is a man whom every machine designer and builder in his territory should know. He is a factory trained man that can give you valuable cooperation in the development and production of machines and equipments to meet today's requirements for higher speeds combined with safe, dependable operation.

A broader use of forgings will naturally characterize the machines of this peacetime era. For forgings provide metals at their maximum strength, toughness and fatigue resistance. Additionally, forgings save weight and space, require less time to machine and finish, and provide a greater margin of safety.

As your source of flat die, drop and upset forgings, Kropp Forge with its greatly expanded facilities, offers an unparalleled service.

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That's what one of our customers said about SHANKLESS Roll-Forged Drills. It's typical of what they all say. Some are attracted by the 20% to 25% lower price—some by the better performance. But they almost always end up by standardizing on SHANKLESS.

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If you use twist drills, it will pay you to get the *complete* story of SHANKLESS Roll-Forged Drills. It's in our Manual S-4, which we will gladly send you on request.



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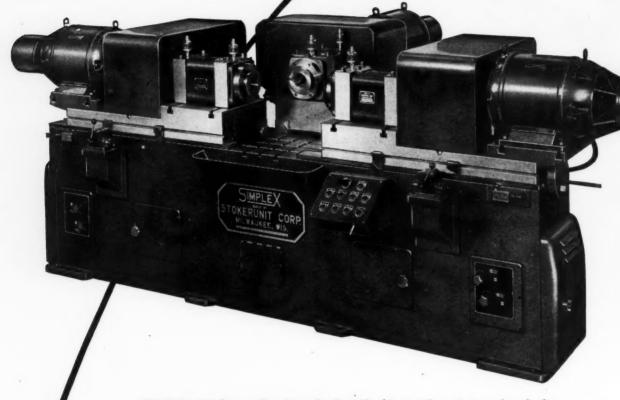
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SIMPLEX

NEW METHODS are needed by many manufacturing plants to obtain the high production, close tolerances, and lower labor costs, so vitally necessary to survive in today's competitive markets.

Performing operations from two or more sides simultaneously, with one clamping of a piece in the work holding fixture, is a logical method of attaining these.



SIMPLEX 2U 3-way Precision Boring Machine with unit type heads for boring and facing — adaptable to many jobs — portable electric tools, small gas engines, outboard motor parts, tractor and automotive units, pumps and compressors, and many others in every-day use, with the advantages of simple and rapid change-over from one job to another.

_Precision Boring Machines

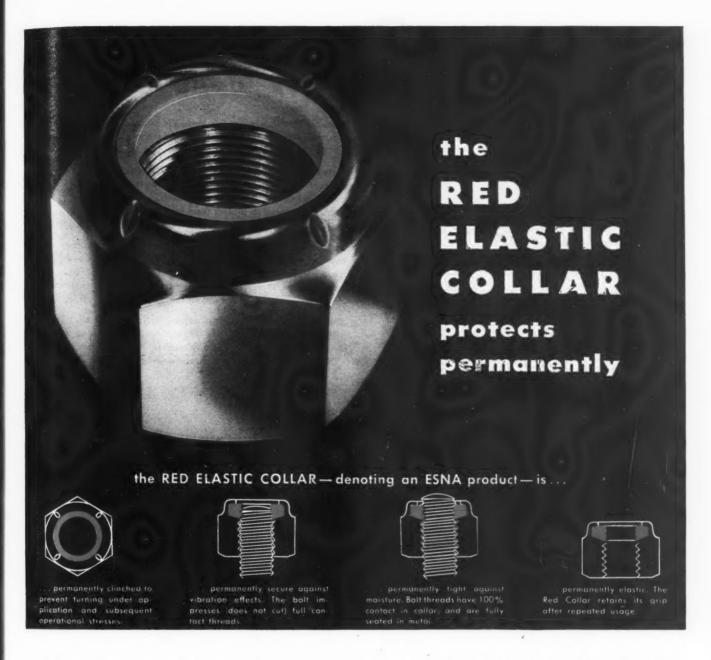
STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4526 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

286-MACHINERY, February, 1946



What happens when this Red Elastic Collar becomes part of a nut? The nut becomes an ESNA Elastic Stop Nut! And it provides permanent protection for any detachable or adjustable assembly.

How?

First, an Elastic Stop Nut locks in position anywhere on a bolt or stud. Every bolt can be precisely prestressed to carry its full load. Positioning devices can be adjusted with precision. Vibration cannot disturb these settings — because the Red Elastic Collar eliminates all play between bolt and nut threads with its full contact, permanent grip.

Second, it prevents thread corrosion. Moisture is sealed out. Adjustment or removal is easy — any time.

Third, it prevents thread damage. Full thread con-

tact in the Red Elastic Collar keeps the metal threads firmly seated. Axial play caused by vibration or stress reversal is

Fourth, it prevents seepage of liquids past bolt threads. Permits nut to be used as a sealing device.

Fifth, it prevents maintenance waste. The Red Elastic Collar, which does not injure the bolt or its plating, permits repeated usage.

Here's a challenge: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts — FREE, in experimental quantities. Or, if you want further informa-

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ELASTIC STOP NUTS



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CHANNEL



PRODUCTS OF ELASTIC STOP NUT CORPORATION OF AMERICA

Designed for greater safety at higher speeds

It is now possible to obtain a positive hydraulic safety stop and jack to completely protect anything around the machine in case of complete failure of the electrical control.

This safety stop is designed to stop the table quickly in case of control failure with a uniform decelerated motion without severe shock to parts of the Planer. All parts are completely enclosed to protect them from dirt and chips so there is no chance of failure.

This stop also is used as a jack for relocating the table over the bull wheel by inserting a handle in the stop and pumping the table back to its running position. No crane or other means, therefore, is required for this operation which invariably results in damage to the gear teeth.

After the stop is used it automatically resets itself. The operator or maintenance department does not have to replace any parts or reset any mechanism, thereby saving time and eliminating the human element.

HYPRO PLANER
Positive Hydraulic
TABLE STOP

THE CINCINNATI HYPRO PLANER COMPANY

CINCINNATI, OHIO

288-Machinery, February, 1946

Inside Story

PRECISION HYDRAULIC

Every Hannifin hydraulic cylinder has these features of improved design and precision construction that promise easier and simpler application, long life without maintenance, and maximum utilization of hydraulic power.

No tie rods. This construction is simpler and stronger, and allows removal of an end cap without collapse of other parts.

Universal end caps. Either end cap can be positioned independently, for convenience in mounting and for simple piping.

Air Vents. Each end cap has air vent plugs on three sides.

Bored and honed bodies. All Hannifin cylinder bodies are bored and honed to exact size. This not only means a cylinder interior that is straight, round, and smooth; but one in which piston assemblies are interchangeable. If a replacement piston is ever needed it can be furnished, and will fit perfectly.

Minimum Fluid Slip. Remarkably low fluid leakage past the piston is assured by exact bores and close tolerances on the piston, plus the use of precision rings.

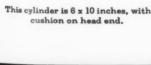
Maximum power. Precision cylinder bodies and piston ring seal provide for consistent high efficiency operation with maximum usable power.

All types and sizes. Seven standard mounting types are available in a full range of sizes I to 6 inch bore, for working pressures up to 1500 lbs. sq. in. Models are available with or without adjustable cushions, and with small diameter piston rod, 2 to 1 differential piston rod, or double end rod.

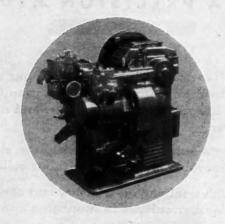
Many special mountings and large size cylinders are also available, built to order. Write for bulletin 35 giving complete specifications.

HANNIFIN MANUFACTURING CO.

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THE NEW NATIONAL COLD HEADER

has been adopted by over 200 Producers. They are the Who's Who of the Bolt and Rivet Industry.

These ultra-modern machines are available in single and double blow, solid and open die, and short and long stroke.

There are over 50 types and sizes.

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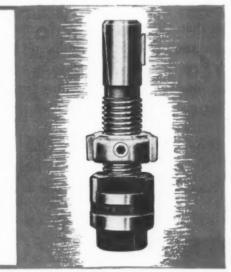
With Customary Attention to Small but Important Details — Jacobs Again Produces an Outstanding Aid to Efficient Drilling Operations!

This modern development in design of Adjustable Adapter Assemblies for Jacobs Production

Chucks provides a quick, convenient and sure means of compensating for variations in drill length. It interchanges with existing Morse Taper adjustable adapters and eliminates the need for Morse Taper Arbors. Jacobs Production Chucks screw directly into a threaded hole in the adapter.

An arc-shaped slot extending partly through the depth of the nut and opening into the bore of the nut locks the nut at any position on the adapter when set screw is tightened – similar to a brake-shoe on a railway car wheel. Cannot cause scoring or damage to threads. An exclusive feature with this Adapter!

Chuck screws directly into threaded hole of adapter to make a single, solid unit.



Made in three sizes, any one of which will, with seven Rubber-Flex Production Chucks, take care of all drill sizes from $\frac{1}{16}$ to $\frac{9}{16}$.

Available through your Industrial Supply Distributor. Write for Bulletin P-4 today. The Jacobs Manufacturing Company, Hartford 2, Conn.

THE NATIONAL STANDARD FOR WAR PRODUCTION



... "Comfortable as an Old Shoe"

There's plenty of talk these days about functional machine design—design that, among other things, makes it easy and safe for the operator and maintenance man. We at Hendey are all for it, and have been for seventy years.

That's why it's easy to spot a Hendey Tool Room Lathe operator. He looks as if he's getting the work out, *and he is*, because a Hendey operator can concentrate on just that. He can get close to his machine and his work because there are no overhanging knobs and levers. He doesn't have to be a gymnast with a "boarding-house reach"; neither does he have to be a fancy dancer. He can stand in one spot and operate the few simplified controls with easy, natural motions.

This goes for the maintenance man too. Automatic lubrication is the rule, individual oil cups the exception. Occasional adjustments can be made easily and quickly without tying up the machine.

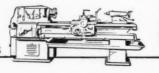
No wonder operators and maintenance men feel that a Hendey Tool Room Lathe is "Comfortable as an Old Shoe."

The Hendey Machine Company



Main Office and Plant - Torrington, Connecticut

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SHAPERS





DAKE SQUARE RAM

gives
Longer Life—
Greater Arbor Press Economy

The square ram is a standard feature on all Dake hand-operated leverage presses. The extra large bearing surfaces prolong the life of the press.

The ram is made of special steel, and heattreated. Accurately machined stub teeth give positive ram action. Machined bearings guide the ram perpendicular to the work. A shimmed ram cap provides the take-up. These structural advantages assure Dake Arbor Press users of longer and more dependable service.

The Dake Arbor Press line is complete ... from small bench type 1-ton models to big hydraulic presses of 50-ton and 70-ton capacity. For complete information . . . send for your free illustrated Dake catalog today.

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TALIDE METAL MEETS EVERY REQUIREMENT

98% More Production per Tool Grind with Talide Tools" -turning, boring, or facing. They keep cut-

The chief engineer of a prominent manufacturer recently compared performance on different carbide cutting tools on a nonferrous aircrast part. He reports...

8% More production per tool grind with TALIDE"

Talide tools eliminate much of the conventional "down time" on any cutting job

Universally used for cutting operations on steel, cast iron and non-ferrous metals and non-metallic materials, Talide Tools are guaranteed to slice production costs.

You can obtain Talide tool tips direct from stock or a Talide sales engineer will call and recommend the proper use and grade of Talide

Carbides for you.



Send for Catalog 44-T Tools and Tips.



Talide TOOLS FOR LONGER RUNS . HIGHER SPEED PERFORMANCE listing standard Talide





YOUNGSTOWN 5, OHIO Pioneers in Tungsten Carbide Metallurgy

CARBIDES FOR CUTTING . HOT PRESSED CARBIDES FOR DRAWING AND WEAR RESIST

PINES: TUBE FABRICATING EQUIPMENT

For Precision High Speed Froduction
to Close Folirances!

PINES Automatic PROFILERS

For processing tubes from the smallest sizes up to 8" O.D. and 100 feet long. Operations include threading, burring, chamfering, facing, flaring, boring, centering, turning, drilling and reaming, one or both ends simultaneously. Pines Automatic Profilers are made in 3 sizes, single and double spindle types. A typical production figure is 1500 %" burred tubes per hour or 700 %" pipe nipples threaded per hour.

Push button control

on all PINES machines

PINES Antomatic CUT-OFFS

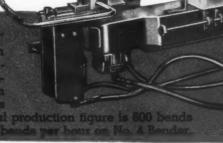
For cutting off tubes of any size or kind up to 5" O.D. Made in rotary, friction and disc types, all of which are available with full automatic operation. A typical production figure is 1500 2" tubes per hour with friction cutting and 150 5" tubes per hour with rotary cutting. Made in 3 different sizes.

PINES

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For bending tubes of pipe up to 4"
O.D. Many exclusive features such
as the pariented Booster Attachment, Annie of Bend Selector, automatic Michael Extractor, Made in
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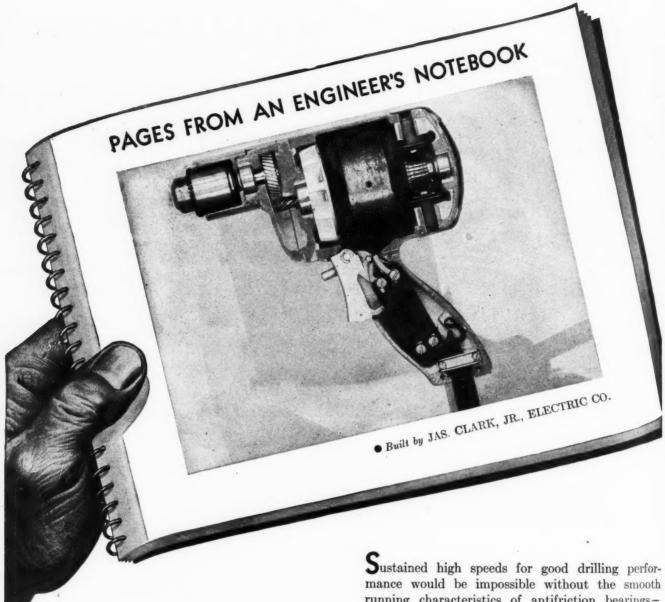




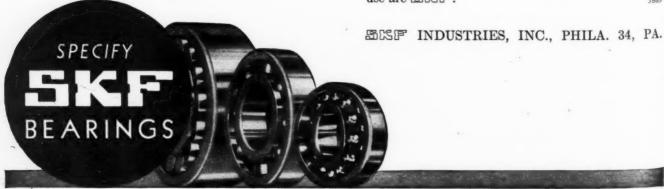


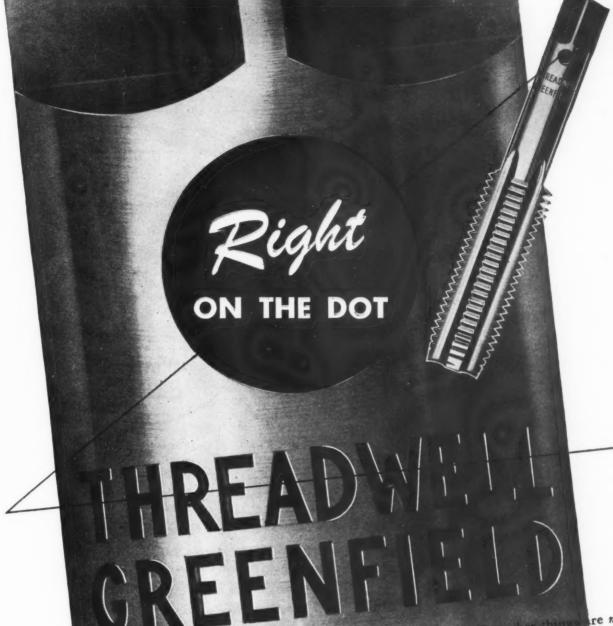
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Para la como trata a secono e econolar e o acesto ao entra a caracterista e escribirar en esta en escribar e e



ACCURACY AT 2450 R.P.M. Sustained high speeds for good drilling performance would be impossible without the smooth running characteristics of antifriction bearings—and BKF Bearings in particular. That's why this Clark ¼" Drill depends upon BKF Bearings. As it turns under full load at speeds of approximately 2450 r.p.m., BKF Bearings cling to their initial close tolerances, run smoothly and continuously. Designed with deep, uninterrupted grooves, BKF Bearings can carry combined radial and thrust loads in either direction. On any machine that removes metal, the bearings to use are BKF.





Color : for ification is an exclusive feature of Thread ell COLD-TEMPER Taps — red dot for high speed cut thread, white dot for commercial blue dot for precision ground.

Other things being equal, color i-dot-ification is a convenience feature that makes it worth while to specify Threadwell. But other things are not equal. Threadwell COLD-TEMPER Tays give pour cleaner, more uniform, more accurate preads and more of them per tap. All we ask is that you try them and find out for yourself. Your local Threadwell distributor is prepared to provide personal well distributor is prepared to provide personal attention to your tap needs.

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hreadwell "TAPS OF DISTINCTION"

THREADWELL

TAP AND DIE COMPANY . GREENFIELD, MASSACHUSETTS, U.S.A.

CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21



For the first time, American industry is now offered the many advantages of reversible wire type plug gages made of Carboloy cemented-carbide in a full range of sizes. These gages, being produced by Lincoln Park Industries, have a size range from .025" to .375" and are made to Class XX and X tolerances.

Provide These Unusual Features

- Solid Carboloy wire type gage members assure long, accurate gage life—at least fifty times that expected of similar members made of steel.
- Wear-resistance allows users to disregard wear allowance for gage life and take advantage of full print tolerance.
- High elastic limit of Carboloy insures against bent and deformed wires.
- Being non-corrosive they will not rust in the handle or in storage.
- Since Carboloy is non-magnetic, the gages will not pick up chips or other metallic substances which might scratch work.

- They are easily adjusted for length by loosening nuts in ends of handle and can be cut off as worn or reversed in handle as required.
- All handles are of collet type and are made of metal throughout, assuring maximum strength and durability. They are not affected by oils, etc.
- Light weight flexible all-metal handles are supplied for sizes up to 3/16". This feature of flexibility reduces hazard of breakage due to accident or rough handling.

Me Pu siç is ab ur to 20 de pi co 4' Al

• Solid handles for sizes over 3/16" are made of aluminum, providing ease of handling and corrosive resistance.



Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1723 FERRIS AVENUE . LINCOLN PARK 25. MICHIGAN

THRST MACHINING ... when the job needs plenty of coolant — this DEEP IMMERSION GUSHER PUMP will provide it!

Model HL-15025-B Gusher Pump, ½ H.P. size, designed for deep immersion, is illustrated above. Available in two lengths (measured from mounting flange to bottom of pump). Long, 20" or X-Long, 24". It is designed to provide a copious flow of water soluble coolant up to 45 GPM at 4 above reservoir level. Also available with ½ H.P. motor for extra heavy duty.

When you want a big reservoir of coolant . . . and a pump that can deliver floods of it to the work . . . this GUSHER PUMP is for you! Model HL-15025-B is especially designed for use with a deep reservoir which may be located below floor level. This pump will deliver up to 45 gallons of water soluble coolant per minute—4 feet above reservoir level. The mounting flange, integral with the pump, may be bolted to the reservoir cover or the bed plate of the machine . . . a simple, compact, convenient installation!

Like every GUSHER PUMP, Model HL-15025-B can handle coolants containing grit or abrasives. No packing glands are used, and there are no metal-to-metal contacts below the mounting flange. Grit and small chips pass right through the pump without clogging it or harming it in any way! Like every GUSHER PUMP, it starts instantly, without priming, delivering any desired volume of coolant from a trickle to a torrent. The shaft, mounted on two large ball bearings, is all one piece, accurately ground and balanced. Write for full details of this and the other coolant pumps in the complete GUSHER line . . . The Ruthman Machinery Company, 1807-1823 Reading Road, Cincinnati 2, Ohio.



GUSHER COOLANT PUMPS

SKINNER MACAS POWER

The modern method for modern machines



Self-centering power chuck with three non-adjusting jaws and forged steel body.



Double-acting, rotating air cylinder for fast operation of power chucks and special headstock fixtures, Series 2100. Power chucking stands ready to make tremendous savings in time and labor on postwar production...where costs will again spell the difference between success and failure.

Skinner stands ready to help with a complete line of self-centering and combination power chucks, air cylinders, operating valves, gages, filters, etc. Skinner power chucks are designed to grip fast, hold tight, and release fast—they cut down on chucking time that otherwise would be an appreciable part of the total time to produce one piece. They are built to Skinner standards of quality workmanship—they are built to last even under severe, constant use.

Write for Catalog which gives complete details on all Skinner products.

Skinner also supplies a complete line of power chucking accessories, such as air valves, pressure regulating valves, pressure gages, lubricators and air filters.

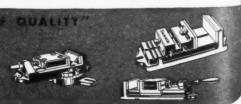
CONSULT YOUR SKINNER DEALER

He is near you—he is ready, willing and able to help you on any standard or special chucking problem you may have.



THE SKINNER CHUCK COMPANY

342 CHURCH ST., NEW BRITAIN, CONN.



HAND & POWER OPERATED MACHINE CHUCKS-AIR CHUCK EQUIPMENT-FACE PLATE JAWS-MACHINE VISES





The Van Keuren light wave micrometer is described in catalog No. 33. This book also gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. WRITE FOR YOUR COMMITTEE TO STANDARD TO STAN

NEW SYSTEM OF ACCURACY—The Van Keuren light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

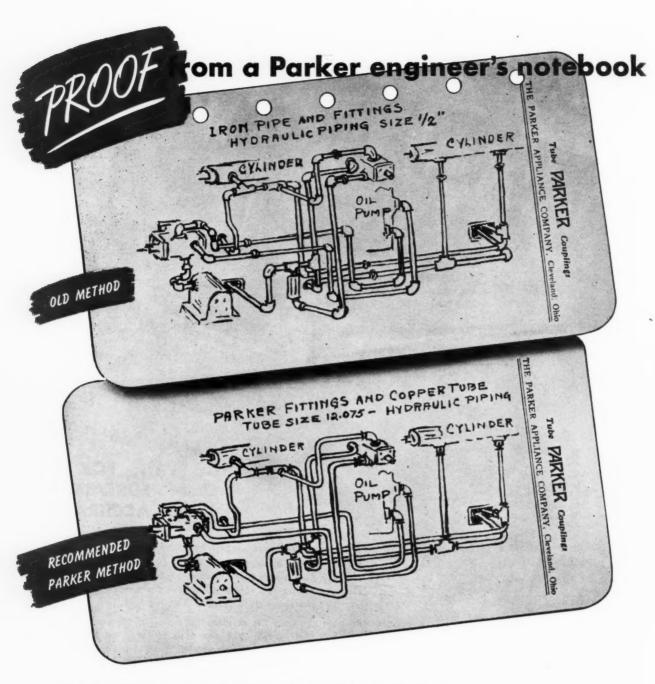
CONTROLLED PRESSURE ASSURES UNIFORMITY—By using the sensitivity of light waves the light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

IDEAL FOR SHOP MEAGUREMENTS—The light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks—use the light wave micrometer. It is fast, accurate and profitable.

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27th YEAR

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Light Wave Equipment • Light Wave Micrometers • Gage Blocks •
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Advantages of Parker Recommendation

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We've engineered Fluid Power installations for many people to bring them these advantages, under a wide range of exacting conditions. May we do the same for you? Let's talk it over.

THE PARKER APPLIANCE CO.



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Matching PRESSES to FORCING Jobs

HETHER YOUR SHOP schedule calls for forcing wheels, pinions, gears, bearings or bushings on axles or shafts...or removing them, once they're pressed on . . . or for other similar assembly or dismantling jobs...you'll find your answer in the wide-ranging line of Watson-Stillman Forcing Presses. Some of these units perform a large number of these operations with but slight adjustment. Others, as is evident from their design and construction, are made for more specialized functions.

These presses range from small compact

Only a few of the many available types and sizes of W-S Forcing Presses are shown here. Write for detailed information on these and other W-S Hydraulic Presses for forming, forging, flanging, straightening, shearing, piercing, bending, assembling, and other metal-working operations. Send for General Bulletin 110-A. The Watson-Stillman Co., Roselle, New Jersey.



WORDS FROM PROMINENT STEELWELD PRESS USERS





CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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25

QUICKLY LOCK AND RELEASE JIG WORK • ELIMINATE SPECIAL BUILT INDEX
PLUNGERS • SIMPLIFY WORK

SIMPLIFY WORK

Universal Index Plungers and Grippits save time and money in the manufacture and use of jigs and fixtures. Universal Grippits speedily lock work for machining. Inserted through a tapped hole in jig or fixture, they take up clearance between plunger and work, clamping solidly and securely with only a one-eighth turn. No hammering, no forcing.

Index Plungers are standardized in three sizes and two types (tapered or straight) for multi-stationed tools.

They require no designing or toolmaking and are easily installed at approximately 75% less than special-made index plungers. Write for complete information.



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A PLAN-O-MILL FOR EVERY SIZE AND TYPE OF CYLINDRICAL FORM MILLING AND THREAD MILLING JOB . . . INTERNAL OR EXTERNAL

Save time, tools, materials and manpower with Plan-O-Mill. Whatever your form milling or thread milling job - internal or external -Plan-O-Mill does a precision job at a production rate.



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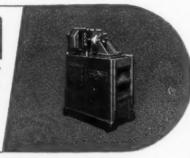
DC

CUTTING TOOLS



NUMBER

Threads and mills up to 2" I.D. or 2" O.D. (with offset head). Requires less than 9 square feet. Electronic feed and speed control panel may be mounted on floor, wall, or ceiling.



NUMBER

Threads and mills up to 8" I. D. or O. D. depending on amount of cut. Electronic feed and speed control with built-in control panel. Over-all length: 751/4". Overall width: 37".



FREE DATA SHEETS FOR PRODUCTION PLANNING



Threads and mills up to 20" I.D. or O.D. depending on amount of cut. Hydraulic feed and speed control.

Overall length: 87". Overall width: 55%".



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IT'S EASY!

SELECTING SAME SOLID END MILLS . . . THE SUPER WAY!

DESIGNED

to do the job right... Super's Standard Solid End Mills are carbide tipped with proper grades of carbide metal, carefully selected to do the best job on the material you wish to machine. Be sure to select the proper tool for the job . . .

DO THIS TODAY

... Write to Super Tool Company for the special folder, showing prices, specifications and proper speeds and feeds to use on every job ... on every metal where solid end mills are used. This information is supplied in detail ... With Super it's easy to select the Right Tool for the Right Job.

- * FOR ROUTING
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- ★ FOR SLAB MILLING

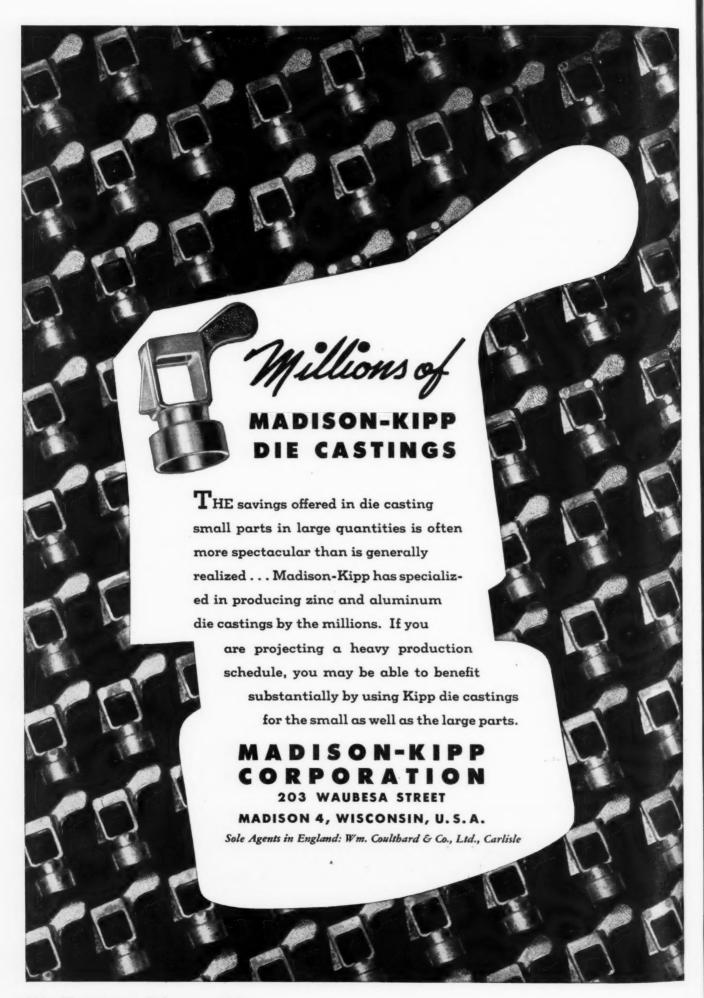
USE

SUPER'S CARBIDE STANDARD SOLID END MILLS

WHATEVER YOUR CUTTING JOB LOOK FIRST TO SUPER Carbide tipped tools for Turning, Facing, Milling, Reaming, Forming, Spot Facing, Boring, Grooving, Counterboring, Shaving, Centers, Grinder Rests, Wear Parts, and Special Purposes.

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.



Knock-Out EXPANDING MANDRELS

They're fast! They're accurate! They're economical!



CAN BE PURCHASED SINGLY OR IN SETS

MODEL NO.	CAPACITY	MODEL NO.	CAPACITY
M0 3/8	3" to ½"	M36	. 1\%2" to 1\%6"
M1 ½'	' to 11/16"	M45	. 1%6" to 2\%2"
M2 11/	16" to 1"	M46	. 21/32" to 21/2"
M3 1'	' to 1%6"	M5B	. 2½" to 3¼"
M4 19/16'	' to 2½"	M5C	3½" to 4"
M25 11/16	" to $^{27}/_{32}$ "	M55	3½" to 4¾"
M26 27	7/32" to 1"	M6B	4" to 43/4"
M35 1	" to 1%2"	M6C	. 43/4" to 51/2"
		M7	2½" to 5½"

IT'S MADE BY LEE IT'S A Knock-Out

YOUR NEAREST DISTRIBUTOR OR WRITE TO K. O. LEE CO.

1130 1st AVE. S. E., ABERDEEN, SO. DAK.

- POWER
- PRECISION
- SPEED



ARE ESSENTIAL TO LOW COST PRODUCTION

POWER to take fast, heavy cuts...to turn a hot chip that makes the coolant smoke...

PRECISION that holds each one of a million work-pieces in exactly the same relation to the tool...and cuts down your percentage of rejects...

SPEED that gets a finished work-piece out of the chuck and a rough one in, in a matter of seconds...

These three factors are built into Cushman Chucks.

Before you decide on chuck equipment for those new machines, consult the Cushman engineers; they can provide special work-holding devices that will help you toward high accuracy, high volume production at low unit costs. Consult us on any workholding problem.

> THE CUSHMAN CHUCK CO. HARTFORD 2, CONN.

A WORLD STANDARD FOR PRECISION



GUSHMAN CHUCKS



Setting-Up Tools

 Few tool investments pay dividends as consistently as an investment in ARMSTRONG Setting-Up Tools.

These correctly designed, strong and convenient tools cut setting-up time to a minimum. They save machine and man hours day after day and assure rigid setups for accurate work, prevent accidents and reduce spoilage.

ARMSTRONG Setting-Up and Hold-Down Tools include types and sizes for every machine tool—"T" Slot Bolts, 6 types of Drop Forged Strap Clamps, Swivel Head Planer Jacks, Non-Skid Vertical and Bracing Jacks.

Write for Setting-Up Tool Circular



313 N. FRANCISCO AVE.

CHICAGO 12, U. S. A.

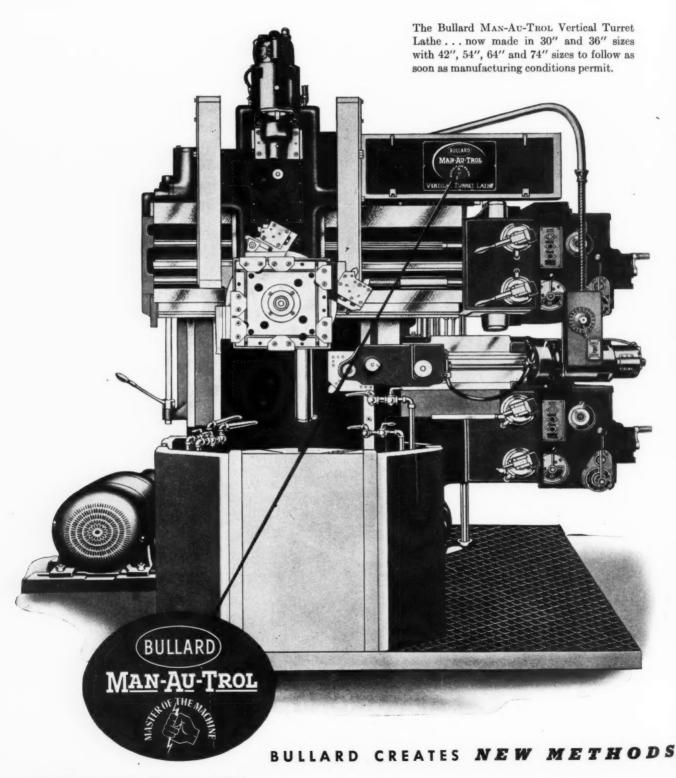
Eastern Warehouse and Sales Office: 199 Lafayette Street, New York 12, N. Y. Pacific Coast Warehouse and Sales Office: 1275 Mission St., San Francisco 3, Calif.

MACHINERY, February, 1946-311

How many classes of work can one automatic machine handle?

NOW...it can handle as many as any manually-controlled machine

M



312-Machinery, February, 1946

The reason is...

BULLARD MAN-AU-TROL

The automatic control that is as versatile as manual control



Classes of Work Performed



Classes of Work Performed by Usual Automatic Machine



Manually-Operated

MAN-ATI-TROI-Onerated

Classes of Work Performed by Machine Equipped with Man-Au-TroL

The proof is...

BULLARD MAN-AU-TROL

Vertical Turret Lathe

No longer must an automatic machine be essentially a special-purpose machine

The Bullard Man-Au-Trol principle of automaticity makes a manually-operated machine 100% automatic . . . gives it all the production advantages such a revolutionary transformation implies . . . without affecting its multi-purpose nature.

In fact, the nature of that machine acquires a broader versatility. Everything it can do as a manually-controlled machine, it can still do under either manual or automatic control.

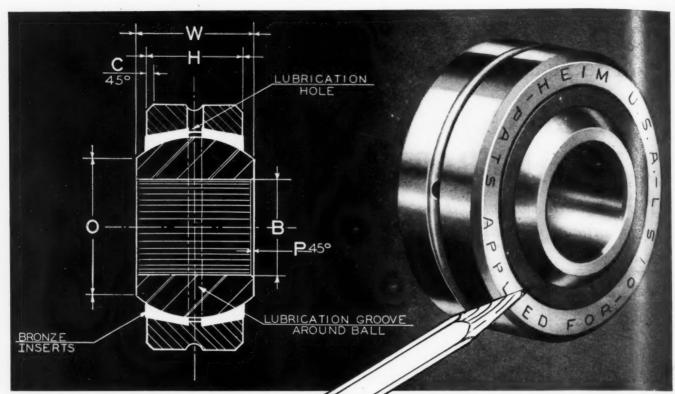
The production-increasing, cost-lowering possibilities of such a unique manually-or automatically-controlled machine are worth investigating. Its quick, easy adaptability to one-piece, small-lot or long-run jobs will help you take diversified schedules and changing specifications in stride...will give you cost and delivery advantages in competitive markets.

At present, Man-Au-Trol is being built into Bullard machines only.

The Bullard Man-Au-Trol Vertical Turret Lathe gives you the following advantages:

- 1. Lightens Labor's Load because the operator machines the first piece under manual control while easily setting the best production method into an automatic cycle...then merely loads, supervises and unloads when Man-Au-Trol's 100% automaticity takes over.
- 2. Makes One Machine Do More because it automatically machines any class of work within manual-control range... is instantly convertible to manual operation on the same or a different piece without affecting the automatic cycle.
- **3.** Cuts Automatic Set-up Time because set-up time from one class of work to another is only slightly more than for a manually-operated machine.
- **4.** Reduces Spoilage because it operates continuously to a degree of accuracy no manual operator can duplicate.

Many other advantages of the Bullard Man-Au-Trol Vertical Lathe are covered in Bulletin MAV-G-1. Write for your copy today. The Bullard Company, Bridgeport 2, Connecticut.



BRONZE INSERTS HERE

MAKE THIS HEIM

UNIBAL BEARING RUN TRUE



UNIBAL BEARINGS AND ROD ENDS

One ball instead of a double row of ball bearings has a greater surface supporting area, therefore a greater carrying capacity. For maximum strength and long wear, this HEIM precision bearing has a ball made from SAE 52100 steel, hardened and ground which rotates in inserts made of bearing bronze. The bronze bearing inserts are made in two parts expanded within

the housing, so that ample lubrication is provided for in the groove between the two parts. Check your present methods of transmitting motion at odd varying angles. The HEIM Unibal Bearing or Unibal Bearing Rod End corrects misalignment in any direction, and will do your job safer, cheaper, and better. Write our Engineering Department for suggestions in applying the Unibal Bearing to your particular product.

PLEASE WRITE FOR COMPLETE CATALOG

COMPANY

CONNECTICUT

THE HEIM FAIRFIELD

BELONGS ON Jour 6" × 18" SURFACE GRINDERS THIS POPE SEALED MOTORIZED SPINDLE

Its full 1 HP G.E motor is sealed in. It runs at top effi-Double Row roller bearings and the thrust bearings are ciency, without attention. Dust, dirt, nuts, bolts and fingers are sealed out. Its extra large SKF Super-Precision, sealed in, too. No lubrication to worry about.

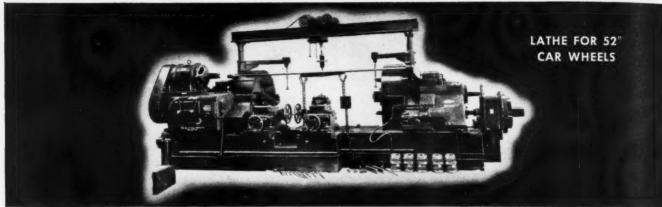
craftsmanship, result in a spindle that will rough off surolus metal fast and then produce a superior finis FOR FINER FINISHES AND PEAK PRODUCTION ith this Pope Sealed-in Motor, Sealed-in Lubri

These exclusive features, combined with Pope pre

261 RIVER STREET . HAVERHILL MASSACHUSETTS BUILDERS OF PRECISION SPINDLES POPE MACHINERY CORPORATION

Contact KAYDON of Muskegon

FOR ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER



KAYDON Bearings Eliminate 85% of Friction!



FROM a catalog of the Niles Tool Works Division of the General Machinery Corporation, we quote: "Self-aligning ball thrust bearings take the end thrust on the face plate spindles (of the big Niles 52" Car Wheel Lathe). They absorb but 1/7th of the power consumed through friction by a plain step bearing."

KAYDON bearings are doing this job successfully . . . a bearing achievement that suggests the improvements KAYDON is helping engineers attain in many postwar

heavy-duty machines, in many industries, through smooth-operating, dependable, precision bearings.

Counsel in confidence with KAYDON. Capacity now available for production of all types and sizes of KAYDON Bearings. In addition, KAYDON also offers complete facilities for atmospheric-controlled heat treating, flame hardening, precision heat treating, salt-bath and sub-zero conditioning and treatment, microscopy, physical testing and metallurgical laboratory services. Plan now with KAYDON.

KΔYDON

KAYDON Types of Standard or Special Bearings:
Spherical Roller • Taper Roller
Ball Radial • Ball Thrust
Roller Radial • Roller Thrust

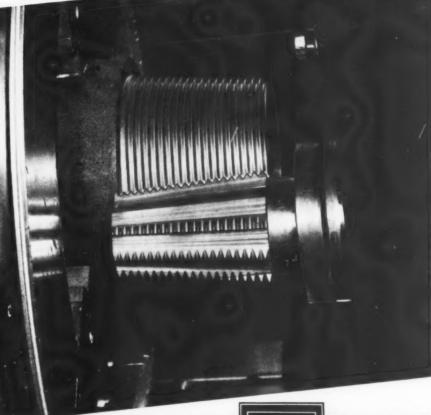
HE I U U I ENGINEERING CORP.

MUSKEGON · MICHIGAN

THREAD MILLING CUTTERS

Multiple thread milling cutters are usually made as wide as the portion to be threaded. This permits threading to be completed in one revolution of the work. When sharp "V" threads are to be milled, "staggered tooth" cutters are recommended.

For all types of thread milling cutters, you are assured accurate work at minimum cost when you specify NATIONAL tools—the National choice.



Leading distributors in every section of the country have stocks of National Cutting Tools Every National distributor offers factory trained engineers to serve you. Call your National distributor for cutting tools or any staple indus-

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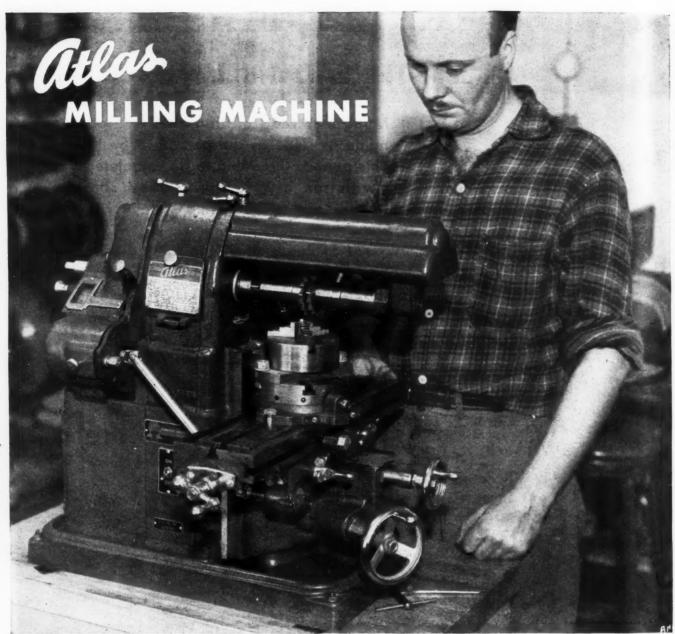


Photo Courtesy Miller Electro Research Laboratories, Milwaukee, Wis.

QUICKER, MORE EFFICIENT on Small Parts Operations

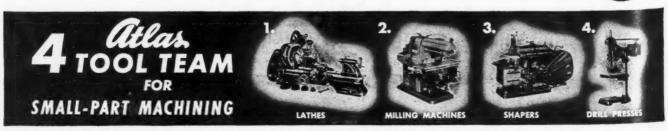
YOU CAN save a lot of set-up time and effort—in the tool room or on the production line—with this compact Atlas milling machine.

Any part that comes within its $4\frac{1}{2}$ " x 18" table traveling 10" longitudinally and $3\frac{1}{2}$ " cross-table, can be milled to close tolerances quickly and easily. There are eight spindle speeds from 62 to 2870 RPM. Three types of table controls are available — manual, lever, or Change-O-Matic. Adding air chuck and control

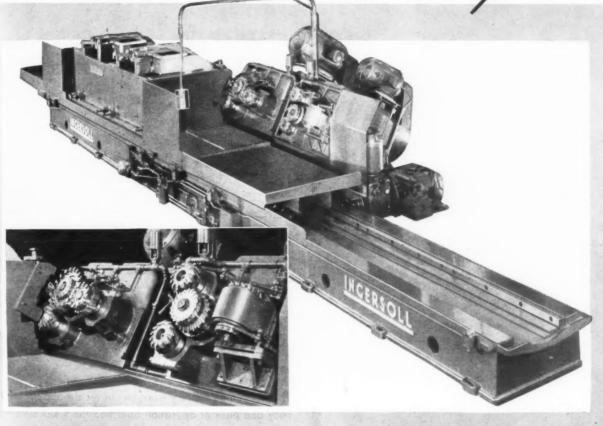
devices gives you a semi-automatic machine capable of suprising production records.

The Atlas milling machine, like the rest of the Atlas 4 Tool Team, helps you "match the machine to the job" to lower machine-hour costs and eliminate wasting the capacities of large machines. Send for latest catalog.

ATLAS PRESS COMPANY, 253 N. Pitcher St., Kalamazoo 13D, Michigan.



INGERSOLL Chainesting...



designed and built this machine to mill thirteen different surfaces on diesel locomotive motor frames in one pass. It finishes two castings in one hour...just one-third the time expended with former standard equipment.

Ingersoll engineers . . . unhampered by convention or standardized design . . . can thoroughly analyze your individual needs from a fresh viewpoint. Whether you require a 300 ton machine or a small machine driven by a fractional horsepower motor, their experience is available to suggest machines that will profitably cut your costs. Our engineers are backed by an excellent shop well equipped to produce boring, drilling and milling machines economically . . . also milling cutters and boring bars. We will be glad to work with you on your problems.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

GRINDING IN 1790 Illustration from Bettman Archives ABRASIVE No.1/2 The eighteenth century workman never dreamed of the accuracy and ease of operation built into the ABRASIVE No. 11/2. This hand operated machine combines precision with speedy production . . . it has simple, convenient controls and a unique spindle design with built-in motor. The No. 11/2 is engineered GRINDING IN 1946 to ABRASIVE'S high standards and is built for lifetime service.

ABRASIVE No. 11/2 HAND FEED SURFACE GRINDER Work capacity: 15" long x 10" wide x 12" high. Table size overall: 48" x 111/4".

Net weight: 1,350 lbs.

Attachments for wet and dry grinding are available.

Write for Bulletin.

ABRASIVE Machines on the Government Machine Tool Surplus Lists may be the answer to your immediate problem of replacing obsolete machinery. Send us the machine serial number for any desired information; we will endeavor to provide attachments, accessories and repair parts as required.

ABRASIVE MACHINE TOOL CO.

East Providence 14, R. I.

a new time" safety initial down advant power



JUSTIPRESS

offers on-the-job proof of its low cost efficiency on scores of operations

AMAZINGLY

COMPACT
POWERFUL
VERSATILE
ACCURATE

PROOF continues to pour in day after day—proof right from the production lines that MULTIPRESS offers

a new and better way to speed output ... cut costs ... reduce "down time" for maintenance and tooling setups ... lower fatigue and increase safety for operators ... make drastic savings in floor space ... reduce initial tooling costs ... minimize noise ... improve quality and cut down on rejects—and so on through dozens of important production advantages!... Multipress packs 4, 6 or 8 tons of oil-smooth hydraulic power into amazingly compact, bench-size units. Ingeniously engineered to accept an extremely wide range of controls, tools and fixtures, it offers operating versatility never before equalled in the machine tool field.

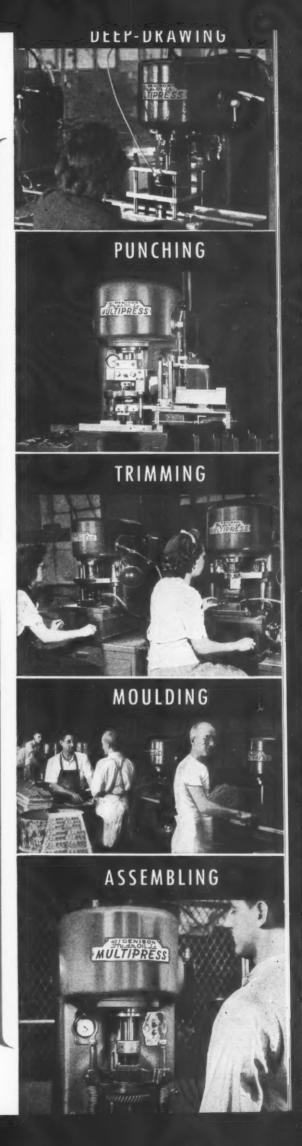
Basic units feature ram pressures that are regulative from 300 pounds to capacity, and ram strokes adjustable from 1/2" to capacity (6 inches in the 4-ton unit; 12 inches in the 8-ton unit.

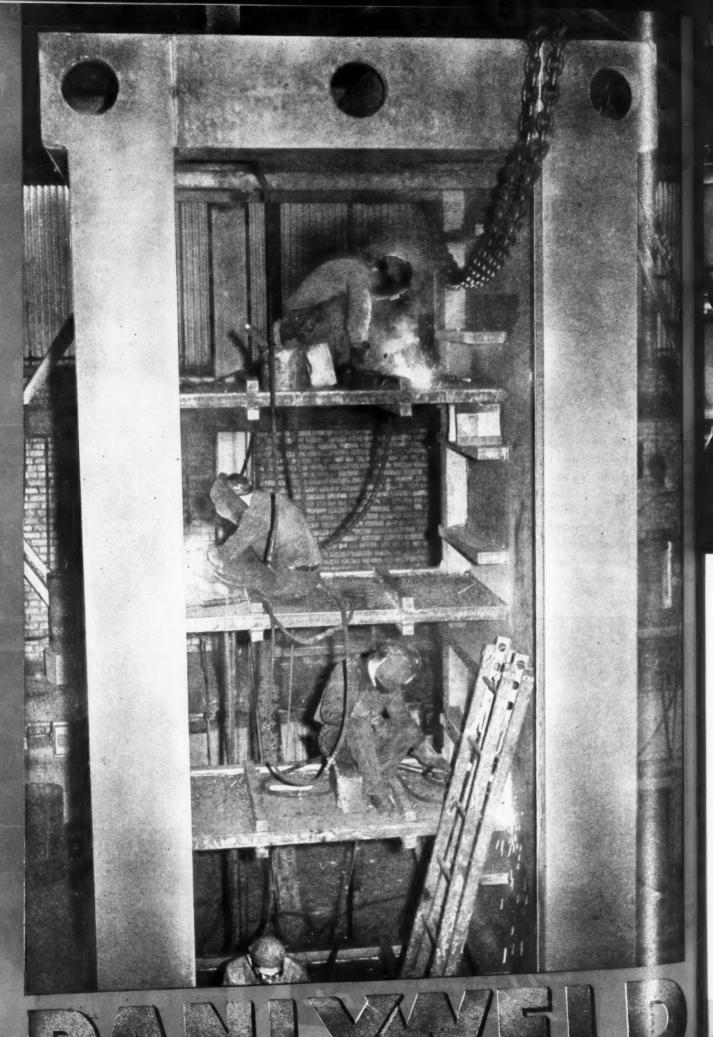
Standard MULTIPRESS accessories include benches, side shelves, extension tables, a variety of bolster plates, straightening fixtures, indexing tables, automatic cycling controls, and the revolutionary new Vibratory Ram Action. The latter provides short, uniform, closely regulative strokes at frequencies up to 500 per minute!

Write today for complete information on MULTIPRESS in terms of your specific needs!

The DENISON Engineering Company 1152 Dublin Rd., Columbus 16, Ohio



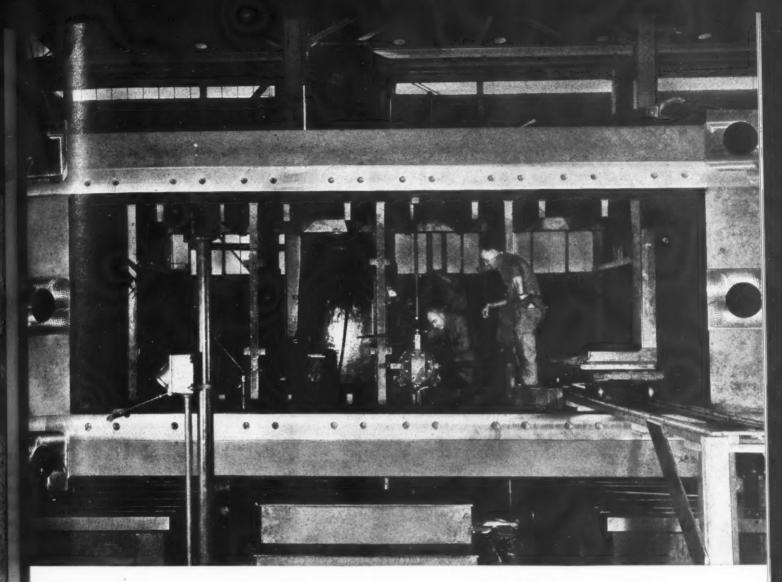




DA

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The Men . . . the Machines . . . the "Know How" for heavy structure welding and machining at

LOWER FINAL COST

Back of this job is a combination of planning — machining stress-relieving — handling — skill and facilities that speak for themselves

Welding four stories high to precision standards

The picture at left shows four men welding simultaneously on a bed for a two-thousand ton, four-point mechanical press. The size of this structure is apparent, but also of major proportions were the problems of welding, handling, stress-relieving, and machining-Problems which were met with the needed facilities, time-tested skill, and fourteen years of experience on large structure weldments. Closely controlled preparation to avoid chance of error, and accurate welding to close tolerances materially reduced machining time.

Machined complete in one basic setup

The same bed is shown above mounted on a floor type horizontal boring mill. This machine is equipped with standard and right angle boring heads, making possible innumerable combinations for milling, boring, and facing. Reversed once during the entire operation, the same basic setup was used throughout, minimizing machining costs-This example of time and money saving is characteristic of the entire job, and typical of the Danly reputation for precision welding and machining at lower final cost—a reputation for "know how."

DANLY MACHINE SPECIALTIES, INC. 2112 S. 52nd Ave., Chicago 50, III.



WELDED AND MACHINED AT LOWER FINAL COST



Formsprag over-runs freely on the slightest reduction in the speed of the driving member. It is compact, simple, rugged—with extremely high torque capacity. It is instantaneous in action, without backlash or lost motion.

On dual drives, or with a stand-in power unit, Formsprag permits the use of either power unit singly, or both together. On multiple speed drives the low speed is automatically cut off when the high speed cuts on.

Formsprag may be used as a safety factor to prevent damage by reverse motion of a shaft. It is the ideal control for drive feed rolls because it offers an infinite number of stops.

or Tailored to Meet Your Requirements

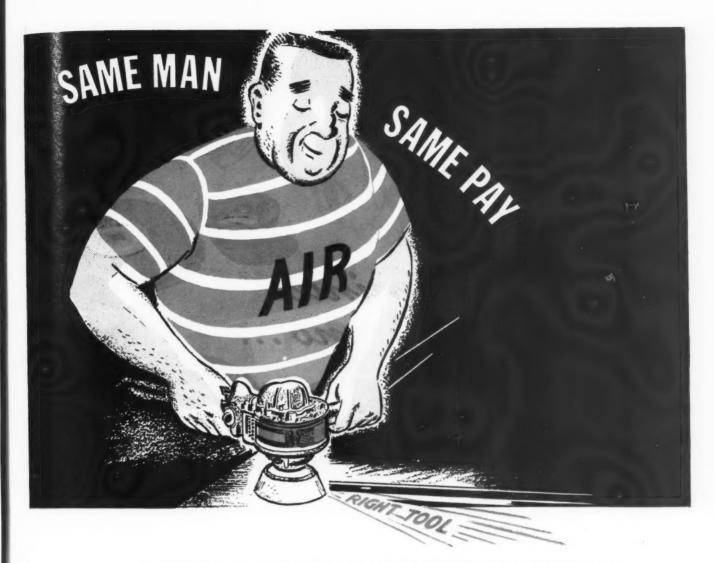
Formsprag is available in a wide range of capacities, both plain and ball bearing types, Formsprag is delivering outstanding perform. ance on spring coilers, Printing presses, rubber and paper calenders, punch press feeds, dual power drives, logging, hoisting, fextile weaving and wrapping machinery.

Standard sizes meet many conditions, but if your product requires special clutches our engineering division is equipped to design the proper clutch to meet your requirements.

Please give full information when writing—a description of the operation, normal and maximum torque at specified speeds, the number of times per minute the spectred speeds, me number or mas per minute me clutch engages and disengages, and other information pertinent to the installation.







...30% MORE PRODUCTION

THIS manufacturer of steel office partitions and doors formerly used 6" straight-wheel air grinders to smooth down corner welds. The Rotor Application Engineer suggested vertical grinders with 6" flared cup wheels. Results:

The same operator, at the same pay, now produces:

30% more output because the larger, flat area of contact of cupped wheel made it easier to hit the spots that needed the grind-off.

Smoother grinds because flat wheel surface didn't slip off welds and mar the metal.

The Rotor Grinder paid for itself in four months as a result of this lower-cost production.

Would suggest that you give the Rotor Application Engineer a whirl at your portable tool problems.

Yours for faster grinding,

AIR O'TOOL





When you buy Simonds & Grinding Wheels, you avoid the unnecessary risk of chance selection. From thousands of combinations of grain, grade, structure and bond, you can narrow down selection to wheels adapted to your job and to your equipment for maximum economy of operation, including low wheel cost. Whether you are dealing in roughing dimensions or the micro-inches of finishing, there is a Simonds Borolon (aluminum oxide) or Simonds Electrolon (silicon carbide) wheel to reveal new grinding efficiency for you.

Through Simonds Abrasive Company distributors over a half century grinding wheel experience provides abrasive products and service backed by engineering and ceramic skill proved by continuous experiment, test and inspection.

The Simonds Abrasive Company 120 page Data Book is good guidance for specification of Grinding Wheels; Segments; Mounted Wheels and Points; Grains, Bricks and Sticks. A copy is available on request.

* Time-honored Borolon and Electrolon Abrasive Products are now distinguished by the name Simonds.

SIMONDS ABRASIVE CO. is a Division of SIMONDS SAW & STEEL CO.

Other affiliated companies are Simonds Steel Mills and Simonds Canada Saw Co., Ltd.



B A B B B RICE



PROFILE MILLING SIMPLIFIED ... by TRACER CONTROL

Two Operations in a Single Setup without Changing Tools



• A prominent airplane engine manufacturer cut production costs, saved tying up expensive machinery and conserved skilled workmen by profile milling this radius of an engine crankshaft section on the Gorton Duplicator. Semiskilled help operated this machine, obtaining smooth finish on the profiling of the irregular channel contour (1) on the part shown at right, and the milling of the channel (2) below

The Duplicator was set up with a special this contour. master in order to eliminate changing tools or resetting the work. A special fixture was used to hold the work at an angle to allow cutter access in milling the channel.

The Gorton Duplicator is the ideal machine for handling jobs like this where uniformity in quality and high precision repetition of all dimensions is required.

Operations—Profile Mill .369" Radius and Mill Channel. Mill Channel.

Machine—GORTON 9-J Super-Speed Dupli-

Part—Rear of Crankshaft—Steel.

Cutter—Special .738" dia. Ball Cutter—4 Flute. Holding Mothod Special Fixture.

Food Manual. Spindle Speed 500 r.p.m.

Spingle Speed—700 r.p.m.

Stock Removed—1/8''.
Floor-to-Floor Time—15 minutes per piece.

GORTON ENGINEERING SERVICE-You are invited to consult Gorton engineers, You are invited to consult Gorton engineers, without obligation, on your next production profile milling jobs. Gorton "Tracer answer may give you the simplest, practical answer to lower cost production. Please submit part, print or specifications to your nearest Gorton print or specifications to Factory at Racine, Dealer or to the Gorton Factory at Racine, Wisconsin. Wisconsin.

The Right Size The Right Type of Machine for Every Job ... From 2 oz. to 2 ton DIE BLOCKS MILLING





GJRTCA Precision

















TEAR OFF COUPON AND MAIL TODAY

George Gorton Machine Co., 1302 Racine St., Racine, Wis. Send me these free books

☐ Condensed Catalog
☐ Die and Mold
Duplicators



.. Title

City..... State..... State.

Proved!

Every Woodworth product must conform to the basic policy of the N. A. Woodworth Company — to produce only the most accurate tools and gages with longest possible service life at lowest initial and operating costs.

That is why Woodworth precision

tools and gages must first be pre-tested—PROVED—in our own laboratories.

That, too, is why they're continually PROVING themselves in actual production—adapting themselves to an ever greater variety of difficult industrial applications.



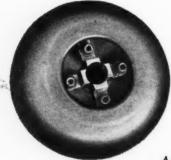
Woodworth has made an enviable reputation in industry with its long-life thread, plug and ring gages made of such wear-tested materials as steel, Durplate, Norbide, Carboloy, Stellite and Nawlide. Write for Catalog 44-G.



Speed up production and reduce costs with Limitrol. The Limitrol Comparator Type Snap Gage checks errors involving pitch diameter, lead, taper, angle, out-of-roundness. It eliminates "feel" and reduces scrap. Write for Folder 44-L.

The Woodworth "Cone-Lok" Jig for instantaneous positive clamping action is rugged, adaptable, mechanically simple. Fully sealed-in lubrication. Low maintenance cost. Wide range of sizes in three styles. Write for Catalog 45-J.





4. The new Woodworth Diaphragm Chuck — speedy and accurate — for precision grinding, boring and turning operations. Steps up production 2½ times. Eliminates "scrap." Write for Catalog 45-C.



ype Jig y duty.



Il Purpose Jig or general ma-



chine shop work. ance were

The Cone-Lok fixture clamp and Cone-Lok unit use the same prociple a
are available for special jigs and fixtures. Ask for data sheet.

ACCURACY YOU W CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD - DETROIT 20, MICHIGAN PRECISION GAGES - PRECISION MACHINED PARTS - PRECISION TOOLS





NEW! VERSATILE! BITS TO DRIVE ANY TYPE SCREW

Something new, something different . . . designed originally to materially simplify and improve the use of the Keys for driving our "Unbrako" socket set, and cap screws. It proved so handy, efficient and convenient, that we re-designed it for all commercial use.

The "Hallowell" "Unbrako" Speed Tool Key Kit is so small, it will fit into the palm of your hand. A hollow, indestructible, black plastic handle holds an assortment of interchangeable bits that enable you to drive any type of screw. The swivel cbuck at the end of the handle permits either the direct drive of a straight-handle screw driver, as shown, or you can snap the chuck to an angle or ell position (see small cut below), so you can drive screws that would otherwise be most difficult to reach. All bits are made of the finest alloy steel, scientifically heat treated to provide a rugged product that will give you long service.

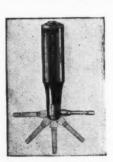


Illustration shows different positions to which swivel chuck permits bit to be swung.



Easily managed, fits comfortably in hand. Interchangeable bits are placed in hollow plastic handle.

The "Hallowell" "Unbrako" Speed Tool Key Kit is made in two sizes:

No. 25: contains seven hex, one Phillips, one slotted screw bit.

No. 50: contains six hex, two Phillips, one slotted screw bit.

If your distributor does not carry it, send his name to us, along with yours, and you will be taken care of promptly.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA, BOX 22 . BRANCHES: BOSTON . CHICAGO . DETROIT . INDIANAPOLIS . ST. LOUIS . SAN FRANCISCO

Get SIMONDS

"RED END" HACKSAW BLADES

... AND GET A LONGER RUN

FOR YOUR MONEY





SEE SIMONDS SOUND-FILM, in color, showing how to get the best results and longest service out of the finest blades made... SIMONDS "Red End" Blades for Hand and Power Hacksawing. You can arrange with your Industrial Supply Distributor for a showing of this interesting movie. Or write to the nearest Simonds office.

SIMONDS SAW AND STEEL CO. BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. Canadian Factory: 595 St. Remi St., Montreal 30, Que.



WELLS No. 8 METAL CUTTING BAND SAWS

The test of a machine is with the man who uses it. Ask men who've used Wells No. 8s, what they think of them.

"Easy to use" will be your answer. All you do is clamp your metal—any size or shape that will fit—into the quick acting vise. From then on, the machine does the work. Both feed and shutoff are automatic.

Because they are so simple to use, one man can operate two or more Wells No 8s at the same time. One saw can be used for all odd metal cutoff jobs or can be equipped with a Wells Wet-Cutting System for quantity runs. Time and labor can be saved by moving the portable Wells to the work.

Any shop man will use a Wells safely and efficiently. Skilled mechanics use Wells Saws to save time and work. Take a tip from men who know . . . because they use Wells Saws and like them. Put a Wells No. 8 to work in your shop . . . now.

To Va

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Specifications

CAPACITY	' :	Re	cta	ng	jula	ır								8"	x	16"
(Special	G	uid	es)											5"	×	24"
ROUNDS:												8	19	Dia	me	ter
MOTOR:										1/2	H.I	P.,	A.	C. 0	r D	O.C.
SPEEDS:				S	elec	cti	ve	60,	90	, 13	0 f	eet	p	er m	in	ute
WEIGHT:							1	Арр	ro	xin	nat	ely	7	50 p	ou	nds



Products by Wells are Practical

METAL CUTTING BAND SAWS

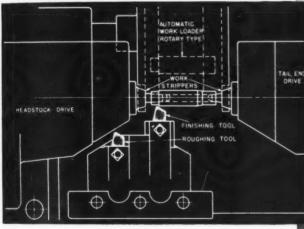
WELLS MANUFACTURING CORPORATION 404 SOUTH GRANT, THREE RIVERS, MICHIGAN

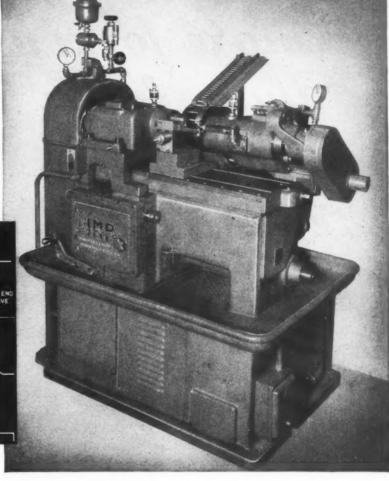
MACHINE OF THE MONTH

REPARED BY THE SENECA FALLS MACHINE CO. "THE So-owing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing Imp Lathe equipped with Automatic Rotary Loader and Double-End Drive.

Tooling layout for turning Valve Guides on Lathe illustrated at right.





AUTOMATICALLY LOADED So-swing IMP SLASHES COSTS ON VALVE GUIDE JOB

PROBLEM: To rough and finish turn valve guides in one operation with separate tools.

SOLUTION: The Lo-swing Imp Automatic Lathe was selected for this job and fitted with a new type Rotary loader and a complete new adaptation of tooling. This lathe is equipped with special revolving head and tailstock spindles driven from a splined jackshaft extending along the rear of the machine. The advantage of this double-end drive is two-fold; since the piece is driven from both ends much coarser carriage feeds are possible, thereby considerably increasing production; inasmuch as both spindles are driven, there is no wear on the revolving centers.

The machine is entirely automatic. Valve guides which have been previously bored to size are placed

in a loading chute and fed by gravity into openings in the Rotary loader. The loader indexes the pieces to the proper position where they are automatically picked up by the continuously revolving spindles of both heads.

The O D is rough and finish turned in the same operation with two separate carbide tools, each having its individual feed. The finish turning tool begins cutting after the roughing tool has been relieved from the work, thereby assuring close concentricity between the bore and the finished diameter.

The Rotary type loader assures complete control over the fast revolving pieces eliminating danger to the operator and damage to the pieces which are completely stationary by the time they reach the discharge chute.

LATHE NEWS from SENECA FALLS

Be sure you don't pay more for a used machine than for a New



ROGERS MACHINE WORKS, INC.

Sales Office: 1809 Elmwood Avenue Buffalo, N. Y.

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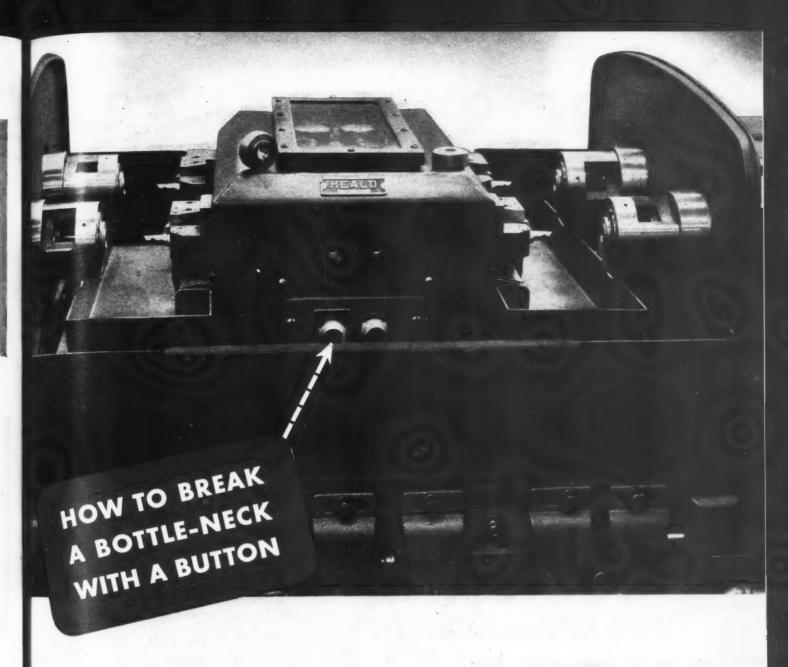
Knowing how since 1885

Low price . . . high precision and production output backed by over 60 years of continuous developments and engineering achievements provide an unbeatable combination. contr

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New versatile ROGERS "Perfect 36" VERTICAL TURRET MILLS pay for themselves on the production line and in maintenance departments.

WRITE FOR CATALOG TODAY that shows how to bore, drill, turn and thread ferrous and non-ferrous castings and forgings more efficiently.



You can't always control production slow-downs—but anytime you can eliminate six or seven manual operations, and replace them all with a single push-button control, your production line is going to move faster, your costs are coming down. And that's precisely what the Heald Bore-Matic is engineered to do.

In turning out work requiring the most complex multiple operations, control of the Heald Bore-Matic is simplicity itself. For here, at the mere push of a button or the turn of a lever, the operator starts a cycle that can be completely automatic from initial cut to final size. What this offers you in faster production, reduced operator fatigue, less scrap and more over-all efficiency can well mean the difference between profit and loss in these

days when production costs must be shaved at every turn.

In the illustration above, we have shown the Heald No. 49 Bore-Matic as used on a transmission pinion gear which is bored, faced and chamfered in one automatic cycle—two pinions being finished in one end of the machine and two others at the opposite end.

Bore-Matic cycles can be engineered to meet your own particular requirements for either simple or complex operations, in any combination including boring, turning, facing, grooving, milling, chamfering. Automatic functions (except for loading) may include rapid in-traverse, feeds, speeds, back boring, tool retraction, runout and control table operation as well as cross slides, cross-feed units,

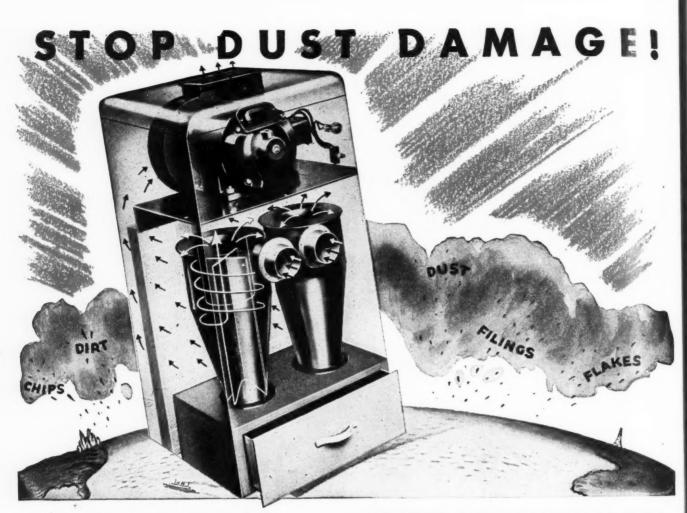
auxiliary slides, spherical attachments. Cycles are usually interlocked and hence foolproof.

Heald Bore-Matics are also available with manual control, but it's the push-button cycle that pays off in top production at minimum cost. Our engineers will gladly submit suggestions on how your production can be improved with the Heald Bore-Matic. Write today for further details.

THE HEALD MACHINE COMPANY WORCESTER 6, MASS.

HEALD

means finer precision...lower costs



PROTECT

Health and Promote Safety

with IDEAL DUST COLLECTOR

Easily installed on any machine Inexpensive . . . Powerful . . . Twin Cyclone Separators

Powerful suction removes dust and abrasive particles from grinding, buffing and other machining operations. Safeguards workers' health. Air passes through twin cyclone separators and a filter, assuring thorough cleaning.

Portable. Easy to install. Compact. No need to relocate machinery. Accessories available to fit various machines.

This development is typical of IDEAL's quarter-centuryold policy of constantly making new and better things. IDEAL now has 100 products supplied by more than 200 IDEAL Service Engineers through warehouses and wholesalers in principal industrial centers, serving IDEAL'S 40,000 Customers.

PROMPT DELIVERY

Machinery Products Division
IDEAL COMMUTATOR DRESSER CO. 1011 Park Ave., Sycamore, III.

IDEAL Sycamore

Helping MACHINERY Serve America Better

NEW IDEAL Lathe CHUCKS

Independent and Universal Types

- Easily adaptable to any lathe.
- Jaws hardened and ground. 2sets — Internal and External Type.
- Cast Adapter witheachChuck.
- LOW COST— High Precision.

IDEAL ELECTRIC TACHOMETER

Designed for measurement of shaft and belt speeds. Can be used as "hand type" or "separable type." Two ranges—0- to 2500 RPM. and 0- to 5000 RPM.

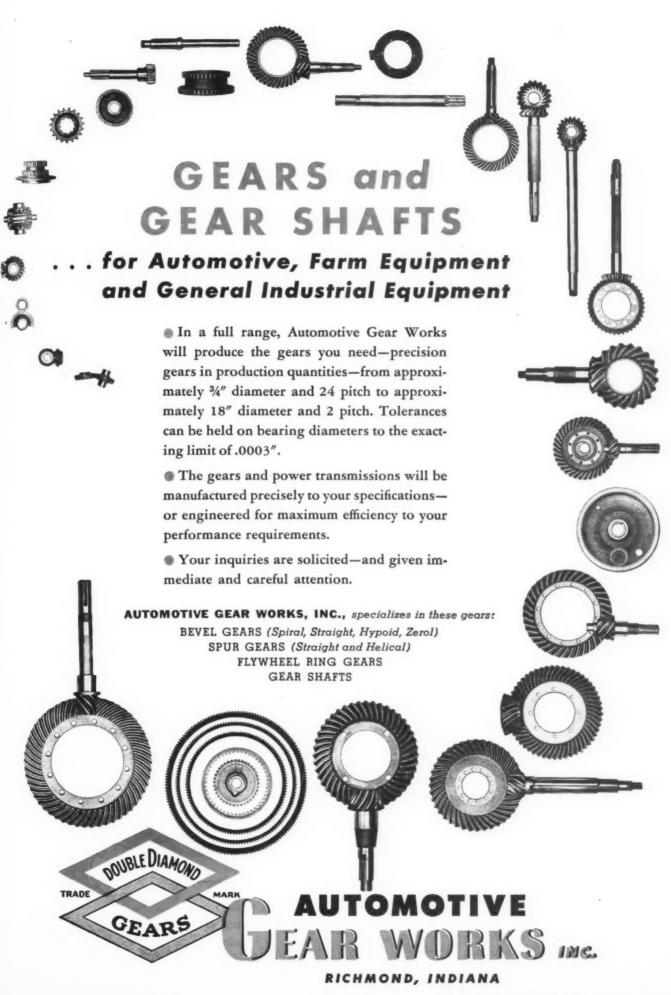
IDEAL LIVE CENTERS

Handle heavier loads . . . permit deeper cuts at higher speeds, because they rotate with the work. Special bearing construction assures accurate turning for precision jobs. Four interchangeable inserts for all centered and uncentered work.

Send for FREE 88-page HANDBOOK describing IDEAL'S many new and better products and methods.



715





We'll lift the covers . . . IN MARCH

In this space, in March, we'll disclose three amazing new turning machines which Monarch has engineered expressly to meet rising production costs. However, if you'd like a quick "preview", we'll be glad to send you photographs and brief descriptions, immediately, with full details to follow the formal introduction. Write Dept. 205.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO



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DAVIS BARS AND SPECIAL BORING FIXTURE SAVE 66 PRODUCTION HOURS 5" Davis Boring and fishing and fishin

5" Davis Boring Barboring and facing shovel turntable on a Giddings & Lewis Horizontal Boring Machine. Note internal boring fixture used to align bores. Adjustable blocks simplify all boring operations.

USING INTERCHANGEABLE EXPANDING BLOCKS TO-GETHER WITH BAR-ALIGNING FIXTURE CUTS OVER-ALL MACHINING TIME FROM 90 TO 24 HOURS

Boring and facing operations on this shovel turntable originally required 90 hours when using single point tools without a bar-holding fixture. To set the tool and align the bar for correct boring required many hours of difficult labor. This time-consuming machining method has been successfully eliminated through the use of Davis Boring Bars equipped with adjustable tool blocks and a bar-aligning fixture. Simplicity of adjusting and changing cutters, combined with an easy means of bar alignment, has reduced overall machining time approximately 75%.

HOW TO INCREASE YOUR BORING PRODUCTION ...

Davis boring bars complete with expanding block type cutters offer the simplest means of producing more bores easier and in less time. It is not difficult to change blocks or to adjust cutters prior to boring. One bar with different size blocks may be economically used for boring various size holes.

Free DESCRIPTIVE INFORMATION

and bar recommendations furnished for boring operations. Learn how Davis Boring Tools will solve your boring problems. Kindly send print or outline your needs.



Davis block sets used for rough, semifinish and finish boring as well as facing operations. High speed steel cutters are used.

Note: Photographs through the courtesy of the Danly Machine Specialities, Inc., Chica

JOB DATA

Part—Turntable. • • • • • • Material—Weldment. Bars Used—5"—4"—31/4"—2".

Number of Bores—24.

- a. 16 bores made changing blocks for rough, semifinish and finish operations.
- b. 8 bores made in single pass of block tool.
- c. All bearing holes faced on both sides with solid block type cutter.

Tolerance of Bores—.001".

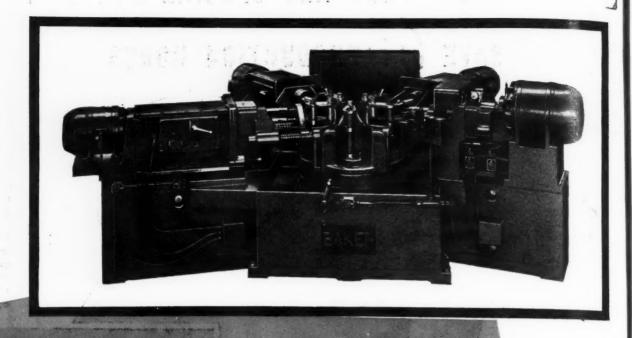
Alignment of Bores—Maintained by internal fixture.

DAVIS

BORING TOOLS

DAVIS BORING TOOL DIVISION LARKIN PACKER COMPANY, INC., (Dept. MA 26), ST. LOUIS 14, MO.

The Multi-Cutter Boring Tools that produce more at less cost



Simplify Y
PEACETIME P

PRODUCTION

WITH BAKER

MULTI-OPERATION MACHINES

Simplified operations are a "must" for profitable production, and Baker has the flexible, multi-operation machines to speed peacetime production . . . to perform all operations on one part at one chucking. Shown above is an example of how Baker standard, self-contained hydraulic feed units are engineered into a high production machine for drilling, rough and finish facing and tapping a transmission case. Three $7\frac{1}{2}AA14$ units perform the drilling and facing, and a multi-spindle individual lead screw and tapper unit does all the tapping operations. The five-station table can be obtained with either hand or automatic power index.

The Baker units employed in this machine are of new design. They have hardened steel ways and a larger diameter of cylinder bore which gives more controllable feed pressure. Speed and feed changes are flexible, and units can be mounted in any plane, at any angle. Furthermore—and this is an important advantage when design changes or changes in production are made—Baker units can be changed over to a new set-up quickly, thanks to their standardized, self-contained design.

Have you a special, multi-operation production problem? Consult Baker engineers. If there is no standard Baker machine to fill your needs, we will design special equipment. Write for Engineering Data Circular $7\frac{1}{2}$ AA14, describing the machine and units shown above.

Single and Multiple Spindle Machines for Drilling, Boring, Facing and Tapping.

BAKER BROS., INC. - TOLEDO 10, OHIO

INSTALL TODAY...

DON'T LUBRICATE

until 1951!

Now that many Westinghouse motors need no lubrication for 5 years or more, maintenance men can practically forget them until 1951. For the addition of prelubricated, sealed ball bearings to the other recent improvements in Westinghouse motors has eliminated the need for constant care.

These prelubricated, sealed ball bearings are available in Types CSP and CS Motors up to 20 hp, frames 203 to 326 inclusive. Hundreds of them have been tested in actual 24 hour-a-day production for periods of time much longer than 5 years. They have saved many man-hours of maintenance work, and brought other advantages as well—

- No overgreasing
- No "skipped" bearings
- No grease contamination
- No grease seepage
- No unreplaced pipe plugs
 This freedom from frequent lubrication brings also a greater freedom to engineers designing new equipment or laying out plants. They can now place motors most advantageously for their operation—unhampered by questions of accessibility and ease of greasing. For further details, write for Bulletin B-3554 and Descriptive Bulletins 3100-CSP and 3100-CS-1, to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Until 1951, there's no need to have anyone climb a ladder to lubricate this motor.

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Another Westinghouse "first"
—this label identifies motors
that you "don't lubricate for
5 years or more"



Save a place

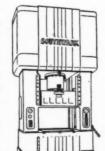
at your planning table

for a BALDWIN PRESS ENGINEER

If you've watched the trend in plant and shop equipment, you know that every year more and more presses have been finding their way into production lines.

Results that once used to require a dozen different shaping, machining and joining operations are now produced by a single thrust of a piston. In addition to economy, the product often gains in strength, appearance and utility because it is formed rather than assembled.

When you're thinking of tomorrow's



products...and tomorrow's competition...the profit and production possibilities of presses are too important to overlook. One of our engineers will be glad to review your manufacturing problem, and suggest the places where a Baldwin Press can help you produce better, faster and more economically in metal, plastics or rubber.

The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia 42, Pa. Offices: Philadelphia, New York; Chicago, St. Louis, Boston, Washington, San Francisco, Cleveland, Detroit, Pittsburgh, Houston, Birmingham.



BALDWIN

SOUTHWARK

HYDRAULIC PRESSES



-but not Condor Compensated with its EQUALIZED PLY STRESSES PATENTED TRACE MARK RECOSTERED

In ordinary belt, as it goes around the pulleys, there is a constant alternation of "stretch and buckle" stresses—different for each ply—which speed outer ply rupture, shorten belt and fastener life.

The way the Strength Members are made and applied in the construction of Condor Compensated Belt lets it flex freely and with equalized ply stresses. This patented and exclusive Compensation principle represents what is probably the most beneficial development in belt construction of the last quarter century.

Reports like these indicate the kind of service you get from Condor Compensated:

An 8-ply, 16-inch Condor Compensated Belt on a paper mill drive is "still performing like new" after 9 years.

"100% more starting load capacity without appreciable belt slip." . . . Many users report 3 to 4 times longer fastener life from Condor Compensated.

"After the second flood receded, we again dried out the belts. Today they are as good as the day we put them on (2 years) and we have not even had to take them up."





Condor Belts will be made in the red color when this is again possible.

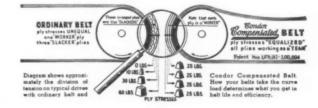
Advantages of Compensation

In all styles of Condor Compensated Belt, you get these belt-saving, production-building advantages:

- 1. Ruptures in outside ply eliminated
- 2. Freedom from ply separation
- 3. Longer fastener life
- 4. Can be operated over smaller pulleys
- For heavy loads, plies may be increased with same pulleys
- 6. Higher overload capacity or margin of safety
- 7. Less wear on pulley side
- 8. High production efficiency
- 9. Material reduction in belting costs

Also available with Style H surface for low tension operation, Style F with friction surface on the pulley side, and Style B with bareback surface on pulley side, where some slip is desirable.

Improve your production now with Condor Compensated Belt. Write for Bulletin.





RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION

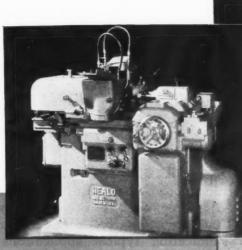
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PASSAIC, NEW JERSEY



in two handy small sizes: No. 1 with independent blower, muffle 7" x $3\frac{1}{8}$ " x $2\frac{1}{8}$ " high. No. 2 with built-in blower, muffle 7" x $4\frac{5}{8}$ " wide, $3\frac{1}{2}$ " high. High speed heat in 20 and 45 minutes, respectively. Uses city or tank gas.

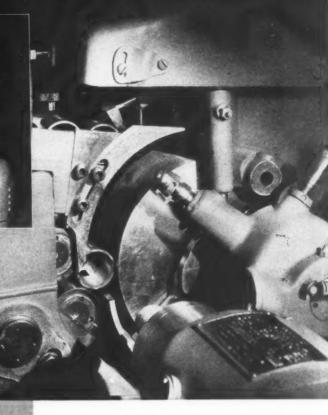




FOR FINER FINISH

use the right grinding oil

GET



- * More Production
- * Longer Wheel Life
- * Less Scrap

REGARDLESS of the metal or type of grinding, Texaco oils assure all the benefits listed above, plus these additional advantages:

- 1. Cool the work quickly, preventing distortion from high frictional heat.
- 2. Prevent loading of grinding wheel, promoting faster cutting.
- 3. Settle grinding dirt quickly.
- 4. Protect finished surface from rust and corrosion.

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For Texaco Products and Enginering Service, call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

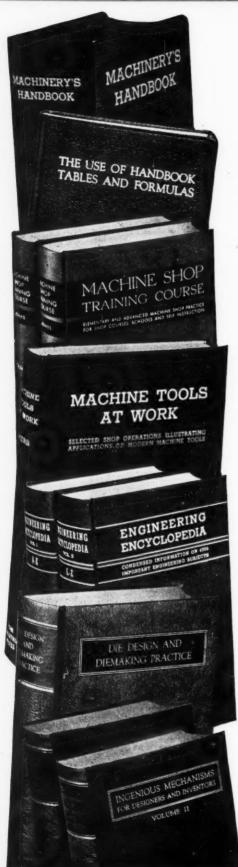


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TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS * METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

MACHINERY, February, 1946-345

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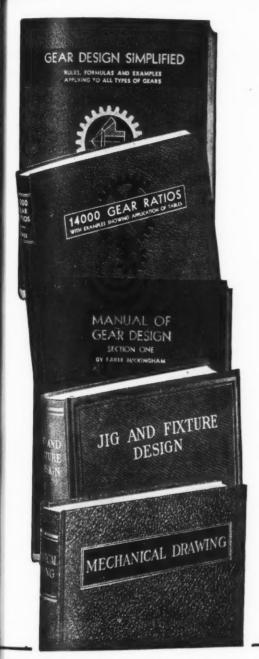
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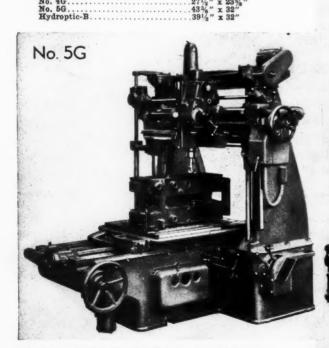
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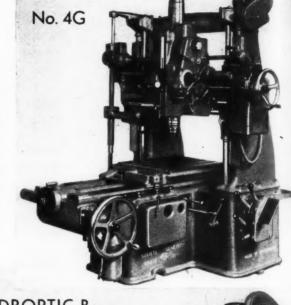
Again available to American industry—for ultra-precision performance and maximum production economy—are the five world-famed SIP Jig Borers ranging in capacity from the compact No. 2C to the generously dimensioned No. 5G, and including the improved ultra-precision Hydroptic-B (below, right). All are ruggedly built, retain their close accuracy even under the heaviest of mechanical stresses, and are recognized as "tops" by progressive tool and production engineers all over the world. Excellent deliveries on the five models listed below. Catalogs furnished upon request.

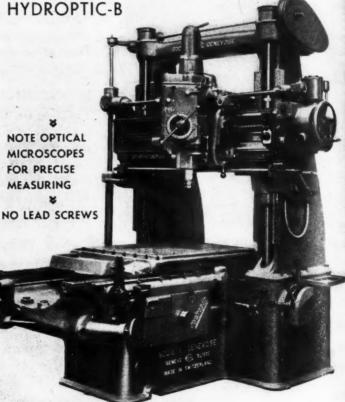
BELOW, RIGHT: Hydroptic-B performs Milling as well as Boring. Guaranteed accuracy to 0.0002" for all settings of work table and spindle head. Has no lead screws. Equipped with optical measuring system and microscopes for incredible accuracy.

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We also represent in the United States other world-famous Swiss High Precision Equipment: Andre Bechler—Maag Gear Wheel Co.—Mikron—Safag—Studer—Sallaz—Schaublin— Lienhard—Billeter.





HIGH PRECISION MACHINE TOOLS

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Cuts all materials. Ram glides on 8 ball bearings. Head operates at any angle. \$374.50 (with 2 or 3 H.P. geared motor).



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WALKER-TURNER COMPANY, INC.

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Speed ranges—110 to 8300 R.P.M. Head tilts 45 e a c h w a y. *\$352.50 (less base and motor).

W-T RADIAL DRILL

W-T BAND SAW

14" and 16" models. 200 - 5300 S.F.M. *\$127.50 (less base and motor-14" model

Prices slightly higher west of Rockies and in Canada



MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED . RADIAL DRILLS
METAL-CUTTING BAND SAWS . POLISHING LATHES . FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL . MOTORS . BELT & DISC SURFACERS

BESLY'S experience can help you

TO CUT COSTS OR IMPROVE FINISH

with BESLY-TITAN abrasive wheels





Above: Besly-Titan Resinoid-Bonded Abrasive Wheels for periphery grinding.

At right: Besly Steelbacs—the modern wheels that are usable to the last small fraction of an inch.

Quickly available to you is the accumulated experience of Besly engineers gained in fifty years on various types of grinding operations—intensified through recent years of high production. What may be a problem for you, may recently have been answered for some other manufacturer with new methods and techniques.

Besly-Titan Wheels made of resinoid bond only, assure smoother, better finish, often without resorting to a finer grit. The semi-elastic nature of Resinoid bond permits operation at high speeds with perfect safety. This bond is flexible and holds the grains just long enough, thereby making for long-lived wheels.

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CHARLES H. BESLY AND COMPANY, 118-124 N. Clinton St., Chicago 6, ill. • Factory: Beloit, Wis.



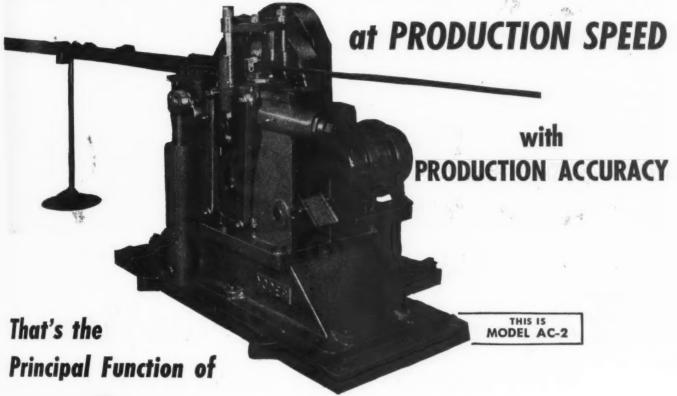
BATH Precision TAPS

HARDENED . TEMPERED . TOUGHENED . . . THEN GROUND FROM THE SOLID!

MACHINERY, February, 1946-351



Cutting Off STRIP, TUBES or FORMED SECTIONS

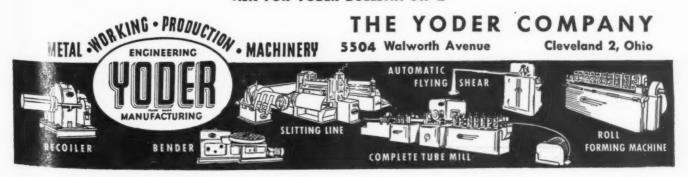


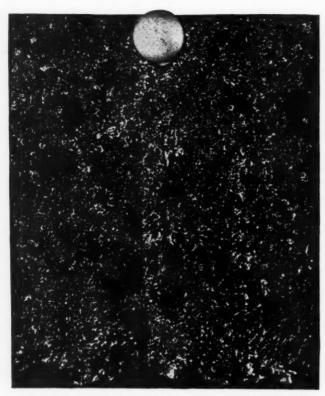
Hoder FLYING CUTOFF MACHINES

No other cutoff method equals their speed and economy... Formed or developed cuts made with long-wearing precision dies...

Machines can also be set up for high speed perforating and embossing.

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Rust made swift headway against this unprotected steel plate, shown after it had been subjected to corrosion test in standard humidity cabinet for 200 hours at 100% RH at 100°F.



This steel plate, shown after it had been subjected to the same test, visibly demonstrates the protection offered by Nopco Rust Inhibitors,

Fight Metal Corrosion with Nopco Rust Inhibitors!

The Inhibitors that give INCREASED Protection through Water-Displacing as well as Rust-Resisting Properties

These new NOPCO Rust Inhibitors offer above-average protection for iron and steel parts and equipment held in damp or wet storage prior to assembly — a protection augmented by their water-displacing characteristics.

These water-displacing features enable the inhibitors to get down to the bare metal surface even when the water layer may be one to two molecules thick.

Applied in a 30% solution to wet or dry steel plates, NOPCO Rust Inhibitors provide a film capable of resisting corrosion for 200 hours or more at 100% RH at 100%F. This is the equiv-

alent of approximately one and one-half years of actual rust-inhibiting service in extremely wet or damp places.

NOPCO Rust Inhibitors afford a range of films from thin, fluid oils through soft and medium-hard wax coatings for temporary protection and easy removal—to extremely hard wax and resinous coatings for more permanent protection under severe weathering conditions. If you are not getting effective, economical protection from rust, it will pay you to put NOPCO Rust Inhibitors to work in your plant now. For further particulars, write

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354-MACHINERY, February, 1946

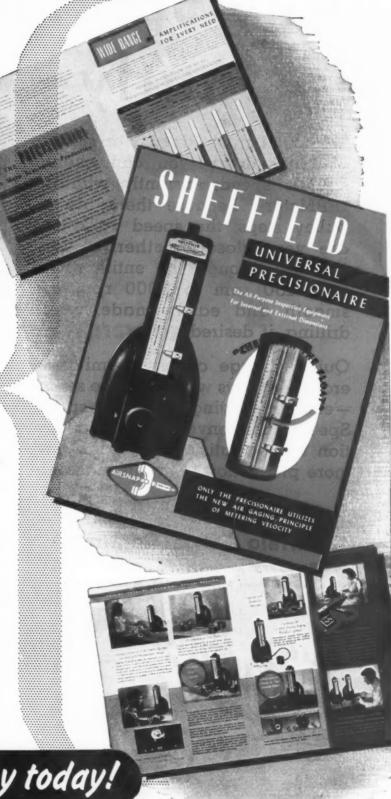
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Without belt-shifting, gear-shifting or other delay, you can change spindle speeds instantly with the "RPMster". Because there are no pulley steps, the speed variations are very close together, so that changes through the entire range from 150 rpm to 3000 rpm are smooth and easily made, while drilling, if desired.

Quick change chucks permit several operations with the same set-up—each employing the proper speed. Speed and convenience of operation means satisfactory usage and more production from this machine.

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Available in brass, bronze, aluminum, steel and other metals, in sizes ½" to 12" I.D., American Metal Hose is manufactured from strip in four spirally wound types. American Scamless Flexible Metal Tubing, flexible as

garden hose and as leakproof as the seamless bronze tube from which it is made, is standard in sizes $\frac{1}{8}$ " to 4" I.D.

Either of these "American" products can be fabricated completely with end fittings to your specifications. You can thus obtain just the type of flexible connection that will best serve your needs.

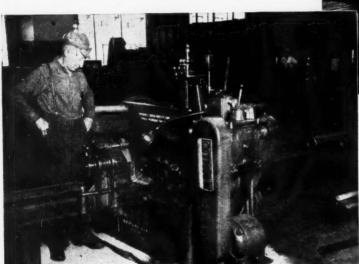
For detailed information, write for Publication SS-50. In connection with exceptional problems, consult our Technical Department.



American Metal Hose

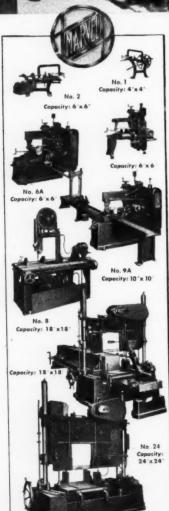
THE AMERICAN BRASS COMPANY—American Metal Hose Banch—General Offices: Waterbury 88, Conn. Subsidiary of Anaconda Copper Mining Company • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

RAILWAYS ARE Streamlining THEIR SHOPS TOO!



(Above) MARVEL No. 9A Production Saw automatically cutting-off hollow iron into staybolts; 1" x 9", 30 bolts to the cut.

(Left) Cutting accurate lengths from $3\frac{1}{2}$ " steel tubing for spring and brake hanger bushings.



Railway shops are "re-converting" not to new products but to newer and more efficient methods.

Today, in the Paducah shops of the Illinois Central, for example, much cutting-off work is being done with MARVEL No. 9A Production Saws that feed, measure and cut-off identical lengths automatically with no more operator attention than is required by an automatic screw machine.

Operating "automatically," the MARVEL No. 9A Saw illustrated above, has cut-off as many as 300 pieces of 1" round staybolt stock in a single hour. Supervision at the Paducah shops tell us that the machine paid for itself in the first 30 days and has been piling up dividends ever since. These extremely accurate and fast saws are not limited to production cutting-off work, because at any point in a "run," the automatic bar push-up can be disengaged, a miscellaneous cut made, and the production run resumed by merely reengaging the bar push-up clutch.

The MARVEL System of Metal Sawing comprises 9 different types of metal-cutting saws; provides the complete answer to most metal sawing problems.

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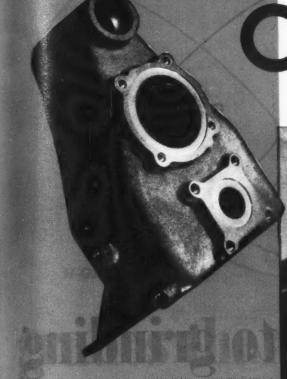
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SMALL LOT PRODUCTION— ANOTHER ADVANTAGE OF

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JIG BORERS



Here is another example of the double utility of Cleereman Jig Borers—production of jigs, fixtures, tools and dies to the highest degree of precision, and the economical manufacture of parts in small quantities.

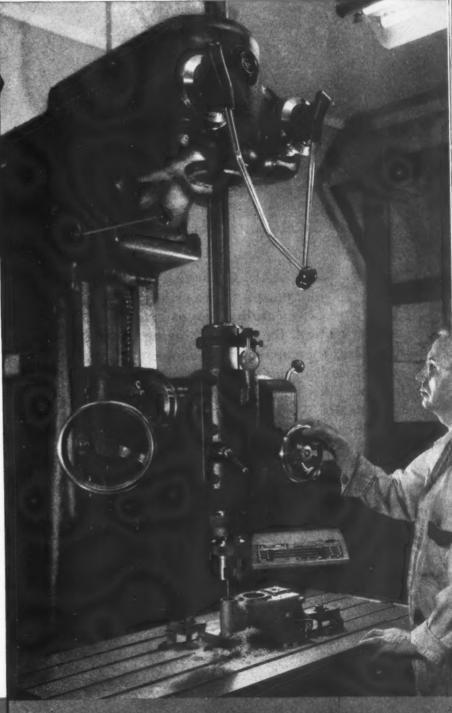
Shown above is one of a lot of several hundred magnesium castings machined by the M. P. Heinze Machine Company, Chicago. Precision boring of the three holes was performed on a Cleereman Jig Borer without recourse to jigs, fixtures, or previous layout. Location of the holes in relation to each other is limited to ± 0.0005 ", and the limit on hole diameter is -0.0003" -0. This job was completed speedily and every dimension was within the specified tolerance.

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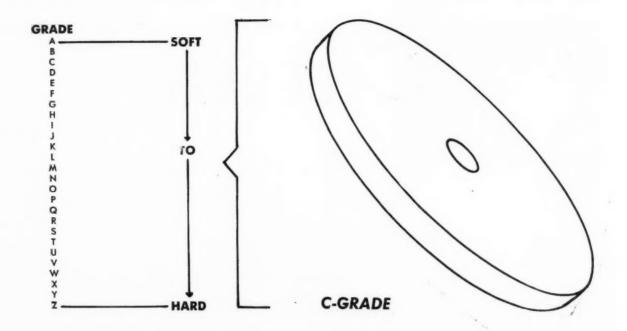
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Cleereman Machine Tool Co. of Green Bay, Wisconsin, organized in 1908 and affiliated with Bryant Machinery & Engineering Company, manufactures fine machine tools including Cleereman Precision Jig Borers and Cleereman Drilling Machines.



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The A, B, C's which appear as identification on a grinding wheel help simplify proper grade selection. By clearly showing relative

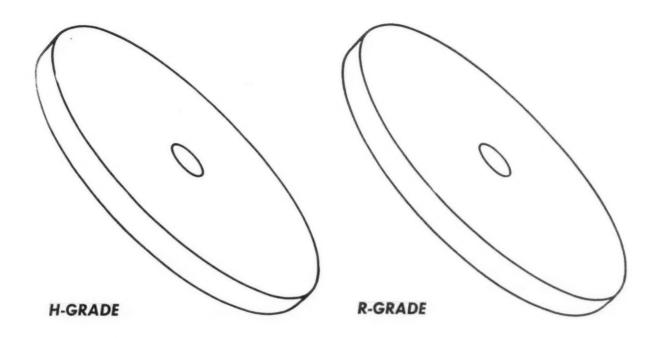
hardness, they make your choice quicker, easier...aid in assuring the right grade for the job. That's one reason wheels by CARBORUNDUM are plainly marked. But, there's more to it than the old chestnut, "the softer the metal, the harder the wheel." It's not that easy.

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And if you need special types of Thread Gages, you can get exceptionally prompt delivery if you will send your specifications, now, to the Small Tool and Gage Division of:

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Limit Thread Plug Gage, No. 9410 (Reversible Construction)

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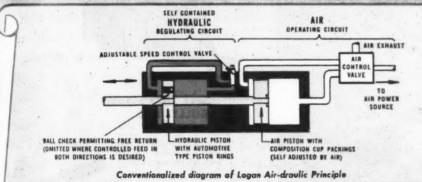
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The Treasury Department acknowledges with appreciation the publication of this message by

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This is an official U.S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council 366—MACHINERY, February, 1946

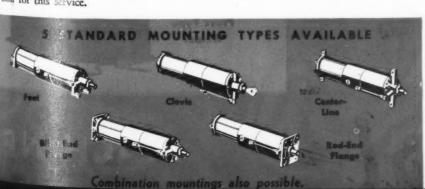




For mechanical operations where accurate control of movements is essential and air operation is preferred, the new improved Logan AIR-DRAULIC Cylinders will give you far more uniform action than is possible with any ordinary air cylinder. Basically, AIR-DRAULIC Cylinders are air cylinders, and may be used wherever compressed air is available. Yet they provide the smooth, controlled feed which is normally obtained only in hydraulic cylinders.

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ENGINEERING HELP-Logan engineers will gladly work with you in utilizing AIR-DRAULIC Cylinder advantages to solve your problems. Layouts furnished. No obligation for this service.



controlled in self-contained HYDRAULIC circuit (no power unit required)

AIR-DRAULIC Cylinder Construction

- Air cylinder is brass-lined steel tubing; piston has molded composition cup packings, self-adjusted by air.
- Hydraulic cylinder barrel is of centrifugalcast iron, with bore honed to a mirror finish. No tie rods. Piston has 3 automotive-type piston rings.
- Hydraulic circuit has leak-proof, vibra-tion-proof Logan Collet Grip tube fitrings.
- · Large air inlets permit pressure to act on entire piston area at once, resulting in rapid response.
- AIR-DRAULIC Cylinders are available in standard sizes from 3" to 8" bore, with any stroke to 5 feet. For operation at air pressures to 150 p.s.i.





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It is no exaggeration to say that the versatility of Federal Press-Type automatic Resistance Welders can never be fully described.

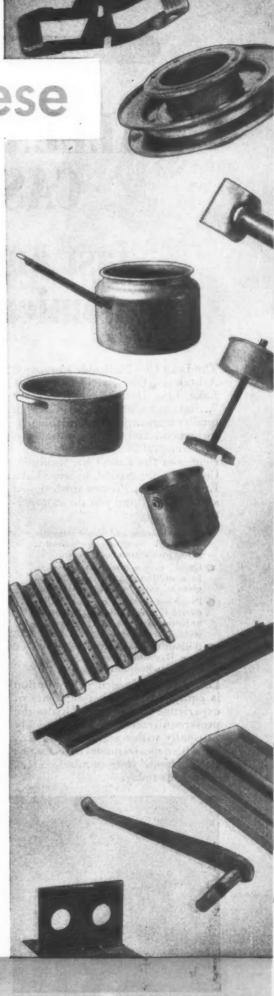
Reason is that new corner-cutting, cost-saving applications are being developed every day in the year. What it boils down to is that if you have any metal fabrication in production quantities involving the permanent fastening of metal, it is important from the standpoint of quality, quantity and cost, that you apply to its production design all of the saving and speeding this type of welding can afford. Whether it be joining of delicate parts, such as in the radio tube illustrated at upper left, or heavy parts involving half-inch steel, like the bell-crank at lower right, or one of a million things in between, Federal Engineers can show you quickly and clearly how the Federal method fits your production.

Shown at left are the smallest (PH-1) and the largest (PH-4) standard models of the Federal Hydraulic Press Type Welders. PH-1 machines rate from 30 KVA to 75 KVA... PH-4's are standard up to 600 KVA. There are many sizes in between, many types to choose from... Air Operated, Motor Operated or combinations of Air and Toggle mechanism. They are adaptable to projection, spot or "percussion" welding or resistance brazing.

Write today for a Federal Press Type Welder Bulletin or arrange for a consultation on your own designs with a Federal engineer.

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... fast and economical

The Lake City Malleable Company, Ashtabula, Ohio, reports that its Lake Erie Hydraulic Presses are "...fast on production...turn out high quality work...give dependable performance...and are low on maintenance costs." These favorable experiences of the Lake City Malleable Company are typical, because Lake Erie Hydraulic Presses are designed and built to bring you these important advantages:

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- Built-in dependability keeps Lake Erie Hydraulic Presses going... keeps production rolling.

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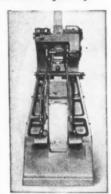


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Drop forgings to fill the demands of today's industries must be closely matched, more easily jiggable and more true to die than those made on outmoded hammers. Competitive conditions give the advantage to parts that require less machining, that need less metal removal.

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Carefully checked records of the performance of Chambersburg Board Drop Hammers indicate that the more effectively guided heavier frames, with improved facilities for maintaining alignment, result in a greater degree of precision over a longer period of time. Fewer adjustments are needed and they can be made more quickly.



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Chambersburg Board Drop Hammers represent the up-to-the-minute, carefully considered essence of experience gained during nearly half-a-century of concentrated and continuous effort in the building of impact machinery.

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A special 75-ton hand-operated press measuring 72" between uprights. Bed is adjustable from minimum of to maximum of 6'.

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A Gap Press with independently operated cylinders providing pressure downward and horizontally.

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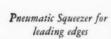
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45 Strokes per minute
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6700 lbs. weight
Also available in plain flywheel type
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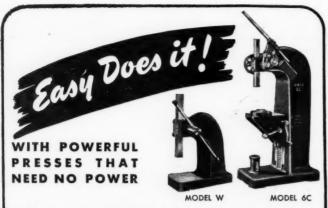
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THE GRANT MFG. & MACHINE CO.

N. W. Station, Bridgeport 5, Conn.

ETNA SWAGING MACHINES

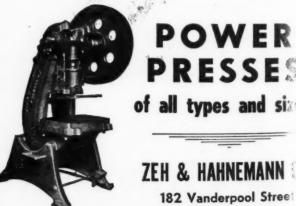
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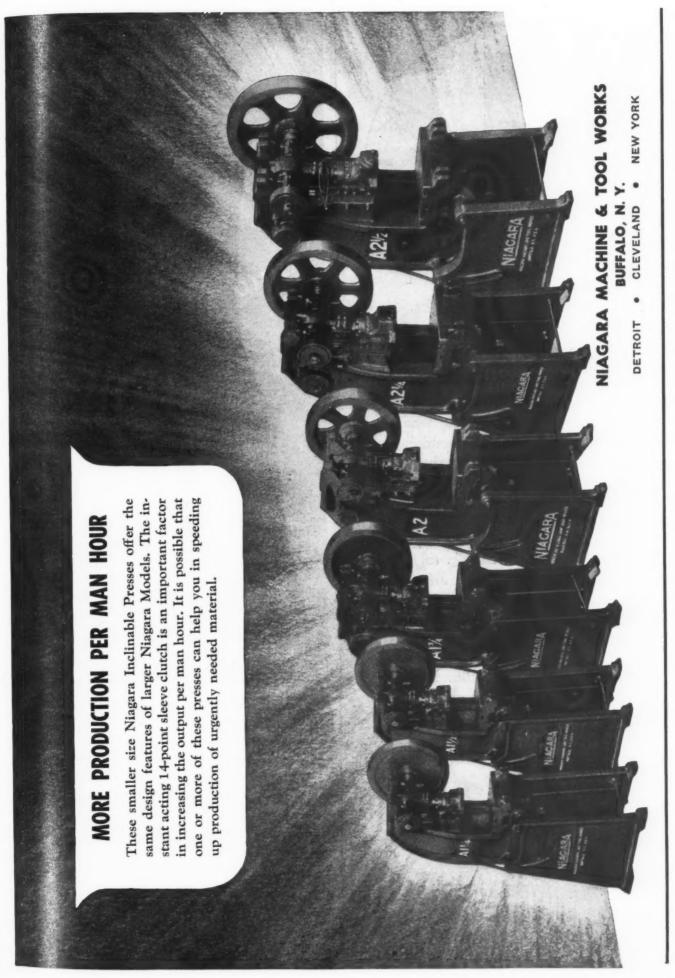




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NEWARK, N. J.





When to recut worn tools?

The answer is, of course, when loss of efficiency and mounting grinding expense outweighs recutting costs.

Sharpening worn cutting tools becomes more and more unprofitable with each trip to the grinder. Large exposed surfaces require more grinding and reduced chip clearance will finally make the tool unusable.

Take advantage of Rutland's recutting service before excessive wear has destroyed tool effectiveness—you will keep your cutters producing efficiently and—

YOU SAVE UP TO 70%

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INQUIRIES FROM AGENTS WELCOME



Highly favored by operators because of their smooth, rigid, compact design. Particularly adapted to the use of carbide tools. Adjusting screw ground from solid AFTER hardening. Graduated in thousandths, widely spaced, easily read. Criterion Boring Heads a re sold throughout the U.S..... your local dealer. Request free



literature.

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Full Ball Bearing Construction

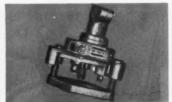
for Longer Life
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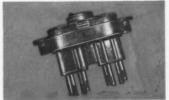
Thriftmaster Drillheads are job engineered! For recommendations and quotation (without obligation) write our engineering department.

Descriptive catalog

MULTIPLE SPINDLE DRILLHEADS









Detroit Representative: B. E. Parish, 3340 Fenkell Avenue

THRIFTMASTER PRODUCTS DIVISION

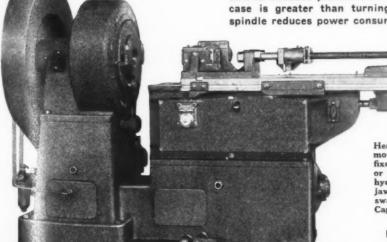
DIVISION THOMSON INDUSTRIES, INC 29:05 Review Avenue, Long Island City 1, New York

Designers and Builders of Hot and Cold Swaging Machines, Hammering Machines, Sensitive Drills, Multiple Spindle Drilling and Tapping Machines, Jigs, Fixtures, Tools, etc. Contract Swaging and Machine Work.

LANGELIER SWAGING MACHINES

Rotary Swaging on new-design Langelier Swaging Machines is ECONOMICAL because no material is removed during swaging operation PRACTICAL because swaging improves grain structure of metal, increases its tensile strength, elastic limit and hardness, and the finish is smooth, to size, and straight RAPID because production from a Langelier Swaging Machine in almost every case is greater than turning or other forming operations. Timken-mounted spindle reduces power consumption, lengthens life of parts, and provides close

concentricity between revolving spindle and circle of head rolls. Investigate!



TYPE D and E SWAGING MACHINE

Head is water-jacketed for hot or cold swaging. Spindle mounted on Timken roller bearings. Head construction with fixed ring or revolving cage is optional. Can be furnished with or without holder. Machine as shown here is equipped with hydraulic feeding mechanism and hydraulic work clamping jaws. Adjustable dogs vary length of quick advance and swaging feed to suit requirements. Return is automatic. Capacity, tubing: Type D, $1\frac{1}{8}$ ". Type E, $1\frac{1}{2}$ ".

DRILLING AND SWAGING SPECIALISTS FOR OVER 50 YEARS ... INCORPORATED 1887

LANGELIER MANUFACTURING COMPANY, PROVIDENCE, RHODE ISLAND

MACHINERY, February, 1946-379



FENN-BUILT SPECIAL MACHINERY

Makes Better Products Faster and Lowers Production Costs



The Aircraft Industry is but one of many diverse industries for which Fenn has created and built Special Production Machinery.

Fenn-Built Special Machinery always results in profitable operations for the user. Fenn does not tackle a job unless they can assure the prospect that new machinery will lower his costs, increase his production, or do a better job. Why not explore these possibilities with FENN. There is no obligation. Write to Dept. E for further information.

THE FENN MANUFACTURING (0. HARTFORD, CONNECTICUT



5



... 108 INCHES BETWEEN UPRIGHTS 500 TONS CAPACITY . . . the feeding of material from right

This Modern Cleveland Four Point Press is equipped with an electrically controlled hydraulic friction clutch and brake and, in addition, the flywheel is arranged with an air brake to bring it to 2 quick stop, when necessary. The slide is air counter. balanced and the uprights are provided with openings which permit

The Press has a 24" stroke, 6" adjustment, 60" shut height and operates at 14 RPM.

This type of Modern Press can be furnished in sizes and capacities to suit requirements.

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SAWS for ALL METALS



Huther Bros. make the saw for your work—for brass, copper, aluminum, steel. Correct pitch, correct tooth form, correct steels—all contribute to maximum speed and efficiency. Write for our catalog of saws for every metal cutting need.

Huther Bros Saw Mfg. Co. NEW YORK



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The 380-ton Farquhar Drawing Press illustrated is one of the many installations designed and made for a specific application.

Engineered for the job and built to "take it," Farquhar Hydraulic Presses are accurate, have quick reaction to control and heavy-duty construction which provide production "plus" service everywhere.

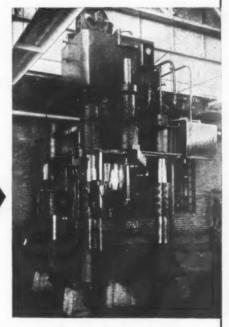


To do your job with ease and economy—to help you solve your problems—which will increase your production—consult experienced Farquhar engineers. They are ready now to assist in the development of the hydraulic press you need.



Farquhar's recognized engineering service and manufacturing ability are evidenced by the thousands of Farquhar presses that have proved their performance in varied industries.

Consult Farquhar for Hydraulic Presses with "take it" ability.



380-ton Drawing Press at the Federal Corrective Institution, Milan, Michigan

Farguhar Builds the Press You Need



380-TON DRAWING PRESS

Daylight......24"

 Stroke
 18"

 Cushion Capacity
 75 tons

 Cushion Table
 30" x 20"

 50 H.P. Pump Unit



.18"













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12" turning length 19½" swing over bed Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM MAY BE HAD WITH PLAIN CROSS SLIDE

No. 3 Universal, 11/2" capacity Also available in No. 2 Plain, 1" capacity ASK FOR DESCRIPTIVE BULLETIN

STOCK DELIVERY

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S-56 LATHE

. compare a SHELDON S-56 Precision lathe with all other 10" lathes in the moderate priced field, and you'll find more accuracy, more capacity, more convenience, more design, more quality . . . from any angle just more lathe.

The SHELDON S-56 lathe has a bed length of 56", with rigid T-girted bed with 2 V-ways and 2 Flat ways which are ground and hand scraped to .0005" of both lateral and parallel alignment. Lead screws are cut on the finest Pratt & Whitney "super precision" lead screw machine. The S-56 lathe with 56" bed is mounted on a rigid 5 drawer steel lathe with 56" bed is mounted on a rigid 5 drawer steel bench (S-44 with 44" bed on a 4 drawer steel bench) which houses an efficient 4-speed (8 spindle speed) underneath motor drive. Each comes with full quick change gears, power longitudinal and cross feeds and standard big lathe features.



- Heavy bronze bearings
 1" Collet capacity
 11/4-inch swing
 Double-walled apron
 Large bardened and

- ground spindle

 Extreme accuracy

 Convenient controls

 Underneath V-belt motor
- drive
 All Steel Bench

SHELDON MACHINE CO., INC.

4246 N. Knox Ave.,

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BUILDERS OF GOOD LATHES SINCE 1919.

Finer Finishes at Roughing Speeds to Meet Tomorrow's Competition



- FEWER MAN HOURS because it is entirely automatic.
- FEWER MACHINE HOURS because it is super-powered for speed.
- FEWER REJECTS because it is super-rigid for accuracy.

Finer and finer finishes at faster and faster speeds! Speed that is not lost through time lags in loading, unloading and operating—or through high scrap losses and rejects!

Those are competitive factors you'll have to reckon with tomorrow. And wornout or over-age lathes won't face up to them. They'll cost you more in lost production, spoilage of product and poor workmanship than new Lipe Carbo-Matic Lathes will cost you.

The Lipe Carbo-Matic was designed and built for carbide tools and for tight limits of finish and

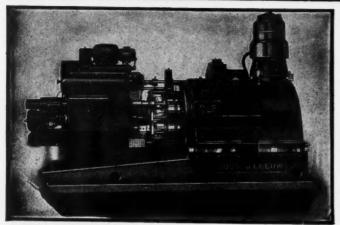
accuracy at roughing speeds. Super fast, rigid as a rock, its cone-worm gear and multiple V-belt drive gives a smooth, chatterless cut, hogging off metal to rough-grinding tolerances on the first pass. Fully automatic, even on complex cycles, it permits battery operation and reduces loading and unloading time to a minimum. A heavier base, over-size motor, accessible controls and other modern features make it the tool of tomorrow.

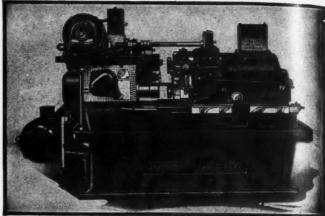
Write or wire for a Lipe engineer to call and explain to you how the Lipe Carbo-Matic will fit into your reconversion program.

LIPE-ROLLWAY CORPORATION

Syracuse 5, N. Y.

GOSS & DE LEEUW Multiple Spindle CHUCKING MACHINES





WORK
ROTATING
TYPE
5 Spindles
6 Spindles

8 Spindles

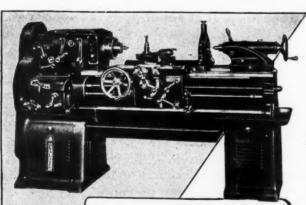
Features include:

Lead Screw Threading on both types—Pre-loaded Anti-friction Spindle Bearings—Hardened Ways—Oversized Spindles— Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL
ROTATING
TYPE
4 Spindles
5 Chucking
Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.



BRADFORD METALMASTER does it faster

Compare BRADFORD'S performance. You'll discover that for speed, accuracy BRADFORD ranks — first. Precision constructed the BRADFORD Metalmaster is designed for your wartime and peacetime jobs. Write for catalogs describing the advantages of this lathe.



BRADFORD MACHINE TOOL CO.

840-1945 CINCINNATI, OHIO

WHY DAVIS KEYSEATERS SPEED PRODUCTION JOBS

Experienced mechanic not required to operate. Thin, flat pieces may be stacked for simultaneous cutting. Quick set-up—only a few minutes, even on taper work.

Tilting Table that can be inclined in either direction from horizontal for taper work (as much as 3" taper per foot). Rapidly and accurately cutting all short keyways and may occasionally be used up to 14" long.



Capacity, keyways 1/16" to 1 1/4" in width.

Write for bulletin giving complete specifications.

DAVIS KEYSEATERS

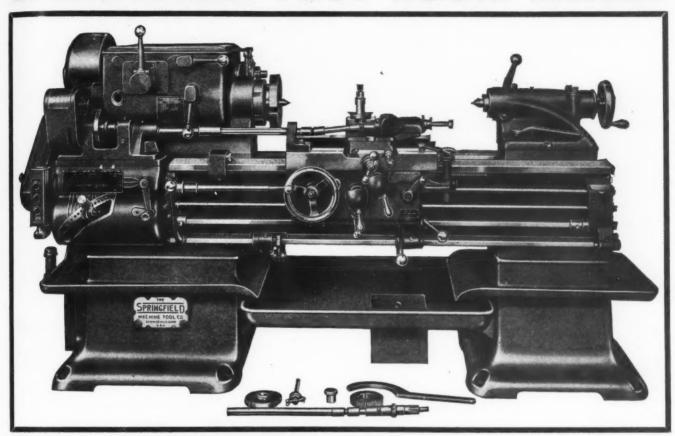


Shown: The tilting table model. Cuts straight or keyways much as 3"

DAVIS KEYSEATER COMPANY 405 Exchange St. ROCHESTER, N. Y.

and the second

* Built for PRECISION, SPEED, ECONOMY— SPRINGFIELD TOOL ROOM LATHES





ODERN design and quality construction are your guarantee of fast, accurate machining - and profitable economy - when you put your work on the Springfield Geared Head Lathe. Every feature, from headstock to tailstock, contributes to efficiency. For instance: the 12-speed spur gear Headstock (left) uses 14 large chrome molybdenum hardened and ground gears with rounded teeth for easy shifting. All drive shafts and main drive pulley are splined and mounted on high grade ball bearings. Spindle mounted on Timken taper roller bearings. All bearings and gears lubricated by oil sprayed over same by pump mounted on main drive shaft. Investigate the Springfield Lathe for YOUR requirements. Built in sizes from 14" to 30". Bulletin No. 162 gives detailed specifications.

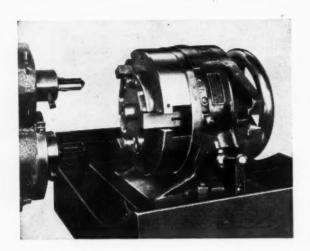
SEND TODAY FOR BULLETIN NO. 162

THE SPRINGFIELD MACHINE TOOL CO. SPRINGFIELD. OHIO

MACHINERY, February, 1946-387



FAST CHUCKING! ACCURATE INDEXING!



THE HARTFORD SUPERSPACER



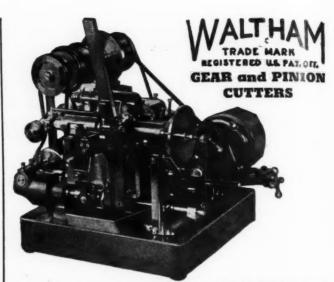
Use the Hartford Super-Spacer Base as the foundation; add special fixtures to meet your own requirements. Shown above, for example, is a Super-Spacer base mounted with a special fixture for speeding a close-tolerance milling operation. Using a 6-notch index plate, three pairs of slots are milled in an aircraft engine part.

Ruggedly built, accurate in operation, the Hartford Super-Spacer is quickly set up, quickly changed from horizontal to vertical operation. Interchangeable mask plates make divisions of 2, 3, 4, 6, 8, 12 and 24—without counting off . . . without any possibility of error.

Write for illustrated bulletin showing how the Super-Spacer can be used for milling, drilling, grinding, jig boring, planing and other operations.

THE HARTFORD

SPECIAL MACHINERY CO.
HARTFORD 5, CONN.



MAKE SMALL PART PRODUCTION ACCURATE AND ECONOMICAL

Use the new Waltham Gear and Pinion Cutter for high production and high accuracy on small diameter, fine pitch jobs. Individual motor drive through step cone pulleys permits a wide range of feeds and speeds. One-second loading and unloading feature eliminates lost motion. Write for full details of this and other Waltham Machines.

WALTHAM MACHINE WORKS Newton Street, Waltham, Mass.

Makers of Small Thread Millers, Gear Cutters and other Small Automatic Machines

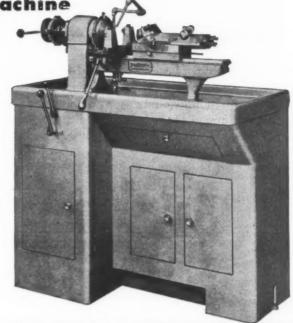


(A)

the dollar sign is on the work...



not on the machine





One manufacturer was dissatisfied with a lathe used for mass-producing parts requiring close tolerances. Wade engineers recommended a Wade Hand Screw Machine — it did the job faster and more easily, and to specified tolerances. The less expensive Wade was the answer.

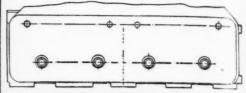
Another manufacturer used a cheaper machine with unsatisfactory results. The Wade Hand Screw Machine, although higher in cost, paid for itself in less than 3 months by producing more, in less time, to a higher degree of accuracy.

The cost of the machine is part of the cost per piece produced. Wade engineers, working on this basis, can give you assistance in choosing the right machine for your small parts production. Call on them.

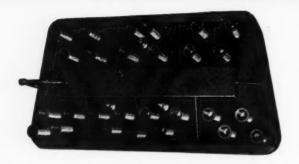


The Wade Tool Company
52 River St., Waltham 59, Mass.

Special HOEFER Unit OFFICE OF THE PROPERTY OF



• Typical Diesel Cylinder Head layout drilled and reamed 51 feet per minute, 286 r.p.m., .010-inch feed, 1½ travel—requires only 31 seconds total time.



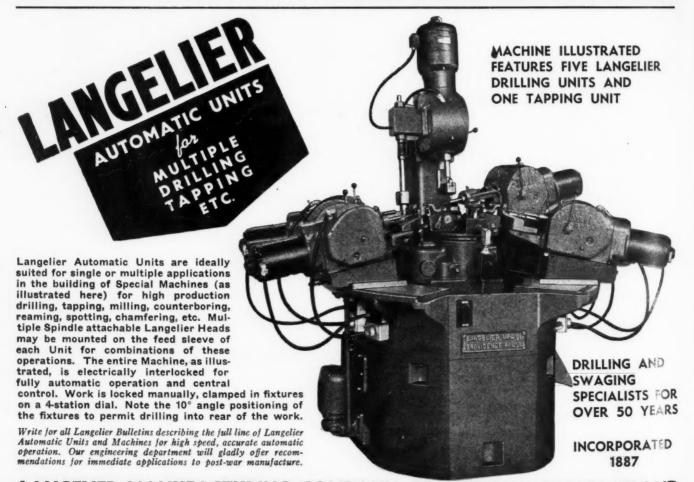
★ This interesting 27-spindle full anti-friction head, with three groups of spindles is capable of being driven in individual groups by engaging drive through one of the three gear shift buttons shown. Forced cascaded lubrication provided in head which was driven by vertical hydraulic feed driller. This head in combination with the

fixture we furnished drills the bolt holes in three different sizes of Diesel engine cylinder heads.

This Hoefer Multiple Spindle Head is an example of the ability of Hoefer engineers to meet the most unusual hole drilling requirements, giving you a simplified method and one that ensures time and cost savings. Hoefer Heads are attachable to your own drill presses or turret lathes. Among the benefits are savings in floor space as well as the cost of new machinery. Having designed thousands of heads our engineers can easily develop a multiple drilling head to fully meet your specific needs. Write, telling us about your job.

Hoefer's Whole Business is Holes · · ·

HOEFER MFG. CO. Greeport, Ill.



LANGELIER MANUFACTURING COMPANY, PROVIDENCE, RHODE ISLAND



This is typical of the versatility of the multiple spindle machines and of the economy of operation resulting from combining several operations on one machine.

Fosdick High Speed Drills are furnished in single and multiple spindles up to six, in capacities up to 1-1/4 inch diameter. Also with bases to accommodate various spindle combinations on center distances from 12 inches to 36 inches.

For low cost, high speed drilling operations consult Fosdick. Our High Speed Drill Bullefin H. S. M. is also available. DRILLING
REAMING
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Phigh Speed
DRILLS

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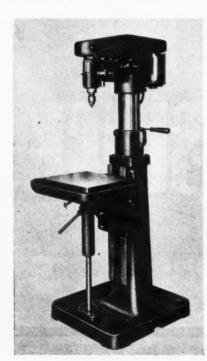
MACHINE TOOL COMPANY



The Carlton Machine Tool Co. offers a complete line of Radial Drilling Machines in sizes ranging from 3' arm to 12' arm, and from 9" dia. column to 26" dia. column. Carlton Radials are delivering outstanding service in almost every large manufacturing plant in the country, as well as railroad shops, shipyards, steel mills, etc. Carlton all - ball - bearing construction with original low-hung drive to spindle makes operation-even under heavy loads - smooth, vibrationless and chatter-proof. Many other modern features available. For greater production, greater economy and satisfaction . . . investigate Carlton Radials today!

THE CARLTON MACHINE TOOL CO. CINCINNATI, OHIO

The Drill with a Hundred and One Speeds



All Speeds Instantly Available

M-125-3/8 Cap. M-96-7/8 Cap. 1 to 6 Spindles.

Correct speed at the turn of a knob.

Speed Chart on front of head.

Ability to obtain exact speed for diameter of drill and material to be used results in less breakage, fewer grinds and higher efficiency.

Speed Ratio: M-125—5 to 1. M-96—4 to 1.

Write for Circulars.

MM-125

MM-96

THE TAYLOR & FENN CO., Hartford, Conn.

Better TAPPING Faster



on a Model DB **CLEVELAND** Automatic Tapping Machine

Give your tap a chance to produce better threads. Our lead screw completely controls the thread accuracy through the entire tapping cycle, taking the load off the tap-Class 3, 4 and 5 gauge fits are therefore being produced on a production basis.

Five Outstanding Features

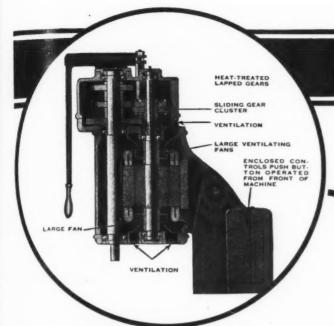
- . LEAD SCREW CONTROLLED
- 100 PER CENT AUTOMATIC
- PRECISION DEPTH STOP SENSITIVE SLIP CLUTCH
- SPLIT SECOND REVERSE

Full Descriptive bulletin available. Write for your copy today.

TAPPING MACHINES

THE CLEVELAND TAPPING MACHINE CO. 3610 SUPERIOR AVE., CLEVELAND 14. OHIO





Avey FEATURE No. 2

THE **Civer** Type ma-6 AVEY-MATIC POWER FED HAND FEED AND REVERSING MOTOR TAPPING MACHINE | features

motor and gear box construction of six speed machine

Motor mounted directly back of spindle with gearing between motor and spindle drive sleeve. Two speed motor, three speed transmission. Only one pair of gears in mesh at any spindle speed. Motor and spindle drive mounted on ball bearings, fan ventilated motor.

Type MA-6 is made in following capacities:

No. 2 - 7/8" capacity in cast iron.

No. 3 - 11/4" capacity in cast iron.

THE AVEY DRILLING MACHINE CO. CINCINNATI . OHIO . U. S. A.

THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE



1st Spindle - Avey-matic Feed 2nd Spindle - Hand Feed 3rd Spindle - Tapping (Reversing Motor)

TIME-SAVING MACHINE TOOLS **SINCE 1901**

Moline Tool Company since 1901 has been designing and building machine tools of the highest degree of efficiency for these operations:

Boring—rough, *semi-finish and finish

- Honing
- Milling-(special machines)
- Straight Line Drillers
- Universal adjustable spindle drillers
- Way Type Machines—horizontal and vertical drilling, tapping and boring machines tical drilling, topping and boring machines "Hole Hog" machine tools are versatile—their construction makes possible easy change-over to other jobs. They are easy to operate and are ruggedly built for years of continuous production service. For man-hour savings—for more efficient, smoother work—look to Moline machines.

Write for information concerning machine tool equipment for your special problems.





MOLINE TOOL COMPANY

107 20th Street

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● 25 YEARS of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, the most complete of any plant in the country, permits us to manufacture any style or size of Cam, Geneva Motion, or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be held to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation to you on your requirements.



BETTER Small Part Production

with THE

Get better production and release larger machines for large work! Use the FREW Hand Miller for accurate, economical production of small parts. Heavy construction and "big machine" guarantee accuracy on heavy cuts. T eatures guarantee accuracy on heavy cuts. Table size
1634" x 534" makes a wide range of work possible.
V-belt drive and Timken-equipped spindle assure smooth operation at all speeds.



THE FREW MACHINE CO. 121 E. LURAY ST. PHILADELPHIA 20, PA.



and ATTACHMENTS

Designed especially for the profitable handling of small and difficult work on a production basis. Burke Milling Machines are available in sizes Nos. 1, 2, 3, and 4, all motor driven.

Illustrated No. 4 Motor Driven Machine mounted on cabinet column. Write for complete details.

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UNIVERSAL Horizontal Boring Machine The only TRIWAY Boring Machine Built

Made in 3", 4" and 5" spindle sizes. Write for complete, detailed specifications. Represented throughout South America by Machine Affiliates.

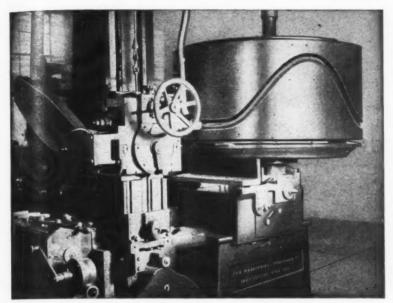


Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.

Hudson, Mass., U. S. A.

... Did You Say BIG Cams?



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ble.

Cast iron barrel cam, 48" outside diameter, 45" inside diameter with a $23\frac{1}{2}$ " face. Throw of cam is 17" and groove is $2\frac{1}{2}$ " in diameter, milled full depth.

If you are faced with the problem of producing extra large cams – put it up to Rowbottom! Unusual cam-making assignments are everyday routine with us. With our equipment, personnel and experience we can provide you with a speedy solution to every problem of cam use, design and production.

Large or small, simple or intricate—cams are our business. Appoint us your "cam milling department" for every job!

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The Rowbottom Machine Co. Waterbury, Conn., U. S. A.

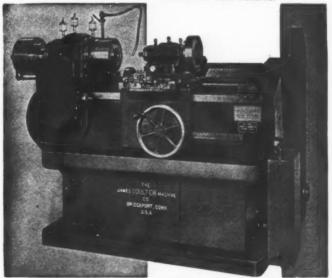
-Rowbottom/&-Cams-



Thread

Production
at Wartime
Speed!

Thread production—internal or external, right or left hand—through automatic cam-controlled action! In the Coulter Type H Hub Thread Miller work and cutter spindles are individually motor-driven, permitting high output on any type of work that can be chucked. Maximum external thread, 7"; minimum internal thread depends on size of hob. Write for full details.



JAMES COULTER MACHINE CO. Bridgeport, Conn.



The tower of a Schneible collector, pictured above, is ruggedly constructed of steel plate — or other material for special requirements. No matter how erosive the material collected may be, all interior surfaces are adequately protected against abrasion by sheets of flowing water, which act as a cushion. There is no appreciable contact between the abrasive material collected and the parts.

rectly designed and built for long, trouble-free

service.

There are no moving parts in the air stream — no parts in the Schneible collector which break, burn, clog or rapidly wear.

Consequently, Schneible dust control equipment requires a very minimum of maintenance.

In operating cost a Schneible system is likewise lowest. It will function indefinitely with practically no attendance. There are no filters, screens or bags to require periodical cleaning. The collected matter, as sludge, is disposed of far more easily than dust.

One of the prime reasons why so many plants are installing Schneible Multi-Wash dust and fume collection systems is that they are the most economical in the long run.

CLAUDE B. SCHNEIBLE CO.
2827 Twenty-fifth St. Detroit 16, Mich.

Engineering Representatives in Principal Cities



SCHNEIBLE

STRENGTH . .



• Two exclusive features, developed by \$ & M, give the ram, vital part of the shaper, the strength so necessary. Elimination of the old style slot gives additional strength without weight increase and provides an automatic ram position lock to protect against costly errors.

Smith & Mills Shapers give you tool room accuracy on production jobs with speed and ease of control that will save time and labor in the shop.

Write for complete details and specifications in latest catalog.

All sizes from 12" to 32" stroke,

THE SMITH & MILLS CO. 2887 Spring Grove Ave. Cincinnati 25, Ohio



SAND-O-FLEX

Here is a low-cost sander that really reaches into recesses, around edges, and handles all those tedious jobs that were formerly done only by hand. Eight bristle brushes "cushion" the abrasive cloth and force it "down in" and "evenly over" all wood and metal surfaces. The central magazine houses the strip abrasive which is fed out as needed. Refill abrasive cartridges are supplied in various grits for all types of work. Loads in less than a minute. Weight 23/4 lbs. Diameter 8", including brushes. Slips onto your motor shaft and produces miracle finishes on curves and contours. See your distributor or write for catalog today.

SAND-O-FLEX CORPORATION 4373 Melrose Ave. Los Angeles 27, Calif.





PRODUCTION FLOURISHES ON GOOD CUTTERS



BROWN & SHARPE CUTTERS — give outstanding performance — keep production high — costs low.

Catalog No. 34 sent on request.

BROWN & SHARPE MFG. CO. . . Providence 1, R. I., U. S. A.

... We urge buying through the Distributor

BROWN & SHARPE CUTTERS

Belt Grinding Proves its Merit

Hundreds of new users attest this newest surfacing method



SIMPLEST FIXTURES

Akron Presform Mold Company machines 100 flat iron bases per hour on a Porter-Cable Wet-Dry Belt Surfacer—using simple hinged fixtures, quickly set up, loaded and unloaded.



LOADING AND MACHINING

Oine-Simplex, Inc., machine bronze castings on a Porter-Cable BG-8 with Automatic Feed in 2 minutes per piece. On an engine lathe it took 9 minutes. Distortion is elim-nated and actual saving is 40c each.



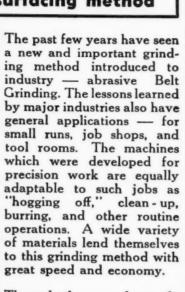
LESS METAL TO REMOVE

Albert Specialty Company changed over to a BG-8 and now provides only 1/82" stock for proper cleanup and finish of both sides of a manganese bronze casting. Former practice required 1/8"! Also saved 6-2/8 hours of skilled labor per 100 castings.

PORTER-CABLE MACHINE CO.



Porter Cable Machine Co., 1801-2 N. Salina St., Syracuse S, N. Y. Please send me the actual photographic proof of your method. This request places me under no obligation.
Name
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Through the use of specific Porter-Cable machines for grinding either with a wet belt or a dry belt, efficiency has increased, costs lowered. and finishes improved. Other models combine both methods-wet and dry beltsfor the shop with varied needs. Illustrated are some examples of Porter-Cable Belt Grinding at work. For scores of other actual case histories, send coupon below.

See Exhibit, Booth L103, Metal Show.





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For diamonds and diamond tools, for prompt remounting service, for wheel dressing equipment of all types...come to Desmond-Stephan. Wheel dressing specialists for 35 years, we can advise you on the selection of the correct equipment for every job. Write for bulletins and get our quotations on your diamond requirements.

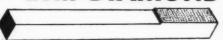
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Horizontal Boring, Drilling and Milling Machine THE LUCAS MACHINE TOOL CO.



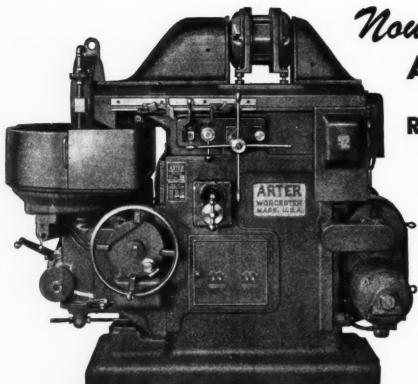
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Improvements and refinements that insure work being ground to extreme precision and high finish are outstanding features of this grinder, held back by war restrictions, but now available. ARTER engineers will be glad to analyze your products and point out to you how this grinder can meet the most exacting requirements of your own surface grinding.

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The herringbone corrugated leather cushion belt—underneath the abrasive belt—is the secret of the incomparably smooth finishes which you can obtain on the TYPE A POLISHING MACHINE. As the two belts pass over the work, high and low points are formed on the abrasive belt, speeding up cutting action and preventing chips from being rolled along with the work. The "Production" two-belt system reduces friction and heat, prolongs belt life and produces precision finishes in record time.

Type A is equipped with a centerless feed, ideal for cylindrical, tapered cylindrical work (attachment available).

Capacity ¼" to 6" diameter. Write for special bulletin describing Type A and the advantages of the "Production" two-belt sys-



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• This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre.. at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x361/4" band. The ideal portable unit.

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Grinding Questions Answered

Continued

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By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY



This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

Q, "We are doing a cylindrical grinding job and think the wheels we are using are a little on the 'soft side' for this work. Is there any way to make these wheels act harder?"

A. Try decreasing the work speed (not wheel speed). This usually makes a wheel act somewhat harder and may enable you to use up your present wheel stocks.

2 a. "Is there any certain point where a wheel should be tapped to tell whether or not it is cracked?"

A. Yes. With the wooden handle of a screw driver tap the wheel lightly at a spot about 45 degrees on either side of the vertical diameter.

3 a. "Is there any difference in the cutting action of a wheel as it wears smaller?"

A. As a grinding wheel wears smaller its cutting action tends to act softer. It also requires more frequent truing.

4 q. "Please recommend a good 'general purpose' wheel for a Model B, Thompson surface grinder. We want a wheel that can be used for grinding both mild and hardened steel and that will give a fairly good finish."

A. For the kind of machine you mention, one of the best "general purpose" wheels we know of is our 8A-46 K-15-V-25 Dayton (old marking 846 K-1-V). Processed of size 46 Dayton Refined Aluminous Oxide grain, with a vitrified bond and of very open structure, this wheel does a very good grinding job on a wide range

of materials. It cuts fast and cool; gives an excellent finish; requires a minimum of dressing; wears at just about the right rate for efficient cutting action.

5 a. "We have a new grinding job that requires a high finish, but all too frequently scratches appear on the finished part. Could this be the fault of the wheels we are using?"

A. We doubt very much whether such scratching is the fault of the wheels as all wheel manufacturers take the utmost precautions to prevent the inclusion of any foreign materials or larger grain sizes than those specified from getting into the wheel. In all probability the scratching is due to small particles getting into the coolant. We suggest you take steps to see that the coolant is properly filtered and also that the tank is frequently cleaned.

• a. "Which is the most important—the pressure of a coolant at the point of contact between the wheel and the work, or the volume of coolant?"

A. Since the chief function of a coolant is to dissipate heat, it naturally follows that the more coolant you use the more heat it will dissipate and carry away. Hence, the volume of coolant used is more important than the pressure employed.

Firm

7 Q. "Does the shape of the material to be ground have any bearing on the work-speed?"

A. The shape of the piece to be ground has a lot to do with the work-speed. If the pieces are irregularly shaped, such as camshafts, the work-speed must necessarily be slow in order to follow the track. For rough grinding, an F.P.M. somewhere between 15 to 30 is usually the most efficient work-speed, whereas for finish grinding the work-speed is reduced to 10 to 15 F.P.M.

8 q. "Is there any rule to determine the number of steady-rests to use in cylindrical grinding?"

A. A very practical rule in this regard is to use from six to ten diameters of the work as the spacing between rests. This is an especially good rule when grinding long and thin work. But no matter how thick and short the work may be, it does no harm to use at least one rest as it will prevent vibration when heavy cuts and rapid table feeds are used.

9 c. "We are grinding hardened steel parts for use on a gun mount. The wheel we have been using is a soft, vitrified wheel, 46 grit. It has done a good job. But recently, there are chatter marks on the work. What could be the cause of this?"

A. Since the chatter marks are a recent development, we think the wheel you are using can be eliminated as a possible source of the trouble. Suggest you check the machine itself and the headstock for vibration. Usually, if the chatter marks are fine, it will be found that the entire machine is vibrating excessively. If the chatter marks are somewhat coarse, are spaced evenly, and run longitudinally, the vibration can be traced to the headstock.

GRINDING

READY NOW...a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.

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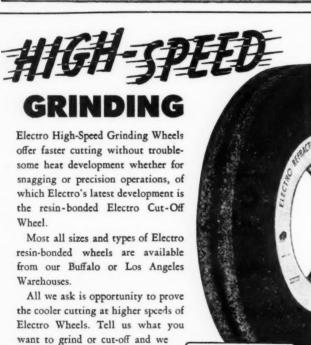
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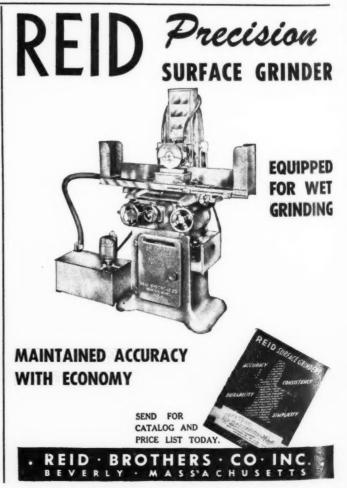
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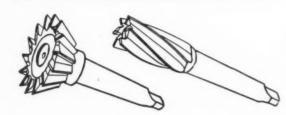




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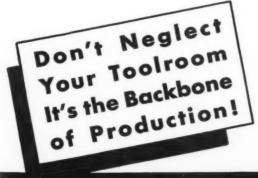
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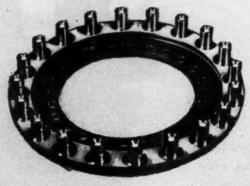
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Bores-millions of bores-dowel pin boresbearing bores-engine cylinder bores-all these and other bores, essential to high quality products-require low cost manufacturing techniques as well as precision.

Industry has always had to spend a lot of its time and money generating precision in bores. Specifications and standards continually become stiffer. Available methods have produced good technical results but they have usually cost too much in time and money.

Microhoning — the modern hone abrading method has recently developed new controls which, at production speeds, generate sufficiently high accuracy and size precision to make possible complete interchangeability of all duplicate parts. Selective fits are no longer necessary when microhoning becomes the final machining process.

Stock removal is at high rates. From .010" to .080" of stock may be removed by Microhoning at rates from .006" to .008" per minute.

If you face new standards of precision in bores which look impossible, investigate Microhoning. It has provided the means to meet many "impossible" demands.









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Micromatic Honing Machines and Honing Tools are built to meet a wide range of Microhoning needs. They provide any desired precision—dimensional accuracy—roundness and straightness in bores—at high production rates.



Has built-in automatic Microsize Control. For internal honing. Rotary indexing work table provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. Bores from ¼" to 2" diameter. Microsize control gauges work automatically. Work is held uniformly within tolerances of .0003". Honing cycle is automatically stopped when correct size is reached.

Automatically holds size within limits of .0001" to .0003" in most applications.

Micromold Honing Sticks are expanded as the tool is honing the bore in combined reciprocating and rotary motion. The expanded sticks act as a plug gage within the selective sizing ring.

As soon as the sticks expand enough to bind on the inner surface of the sizing ring, the ring turns automatically shutting off the machine.



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In a large industrial powerhouse, G-E Fabroil nonmetallic gears are used on the coal conveyors. They do a good job in silencing this heavy equipment and also save money on gear replacements.

The bucket conveyor gears made a terrific noise before G-E Fabroil gears were installed ... men working in the powerhouse said, "The racket could be heard for blocks, but now we can talk near the machines and be heard."

An endless belt type of conveyor which is over 500 feet long and carries the pulverized coal to the boilers also utilizes G-E Fabroil gears. This conveyor travels fast and has vibration. Metal

gears lasted but months—Fabroil gears are lasting for years.

A wide variety of applications can be covered with G-E nonmetallic gears because two types are manufactured . . . Fabroil for heavyduty applications—Textolite for lighter ones. They are both strong and tough, a factor which contributes to long life—fewer delays and shutdowns of your machines—and money saved on gear maintenance.

For further information or our bulletin, "Silent Gears," write to Section F-1, Plastics Divisions, General Electric Company, One Plastics Avenue, Pittsfield, Mass.





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Boston Gear Standard Type "U" Reductors (speed reducers) are just one of fifteen types designed and built to provide you with economical and efficient means of speed reduction. They are available in ratios of 33/4 to 1 to 100 to 1 and are rated to carry output loads varying from 1/20 to 23/4 horsepower. All type "U" Reductors are

equipped with phosphor bronze worm gears, hardened and ground steel worms and all shafts are mounted on Timken Tapered Roller Bearings.

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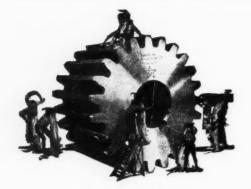
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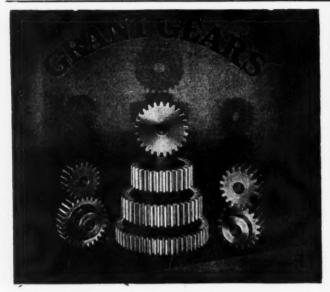
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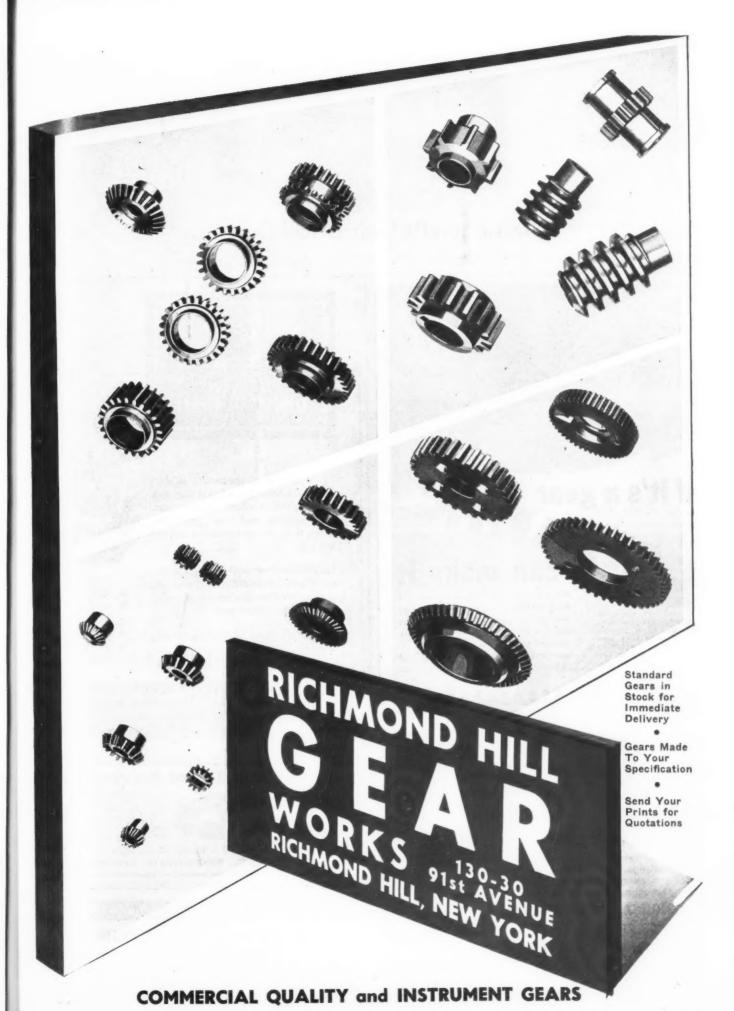
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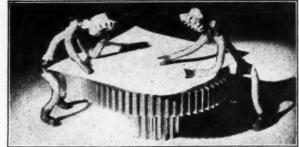
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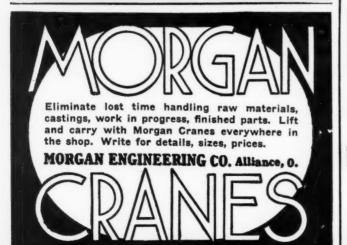
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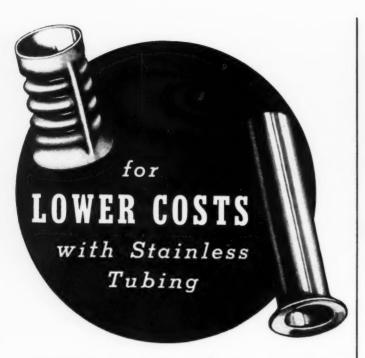




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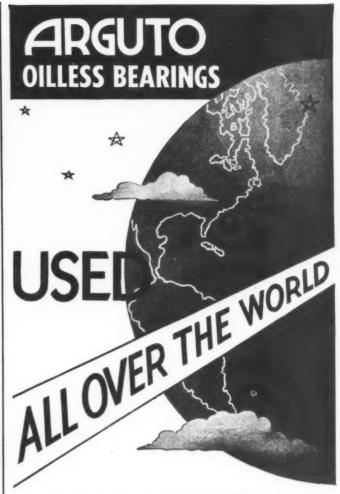
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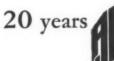
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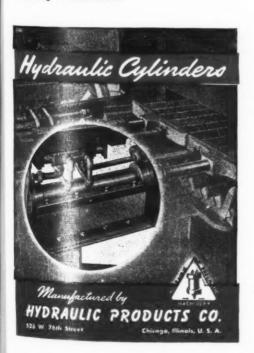
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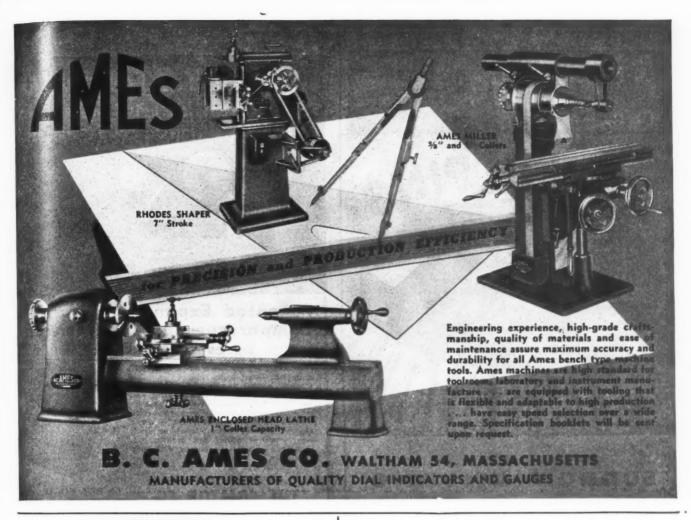
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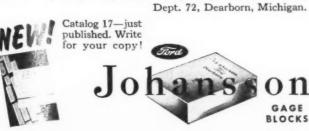
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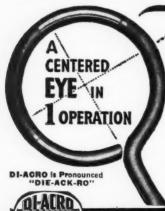
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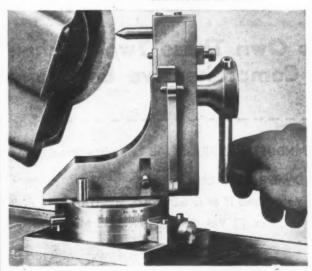
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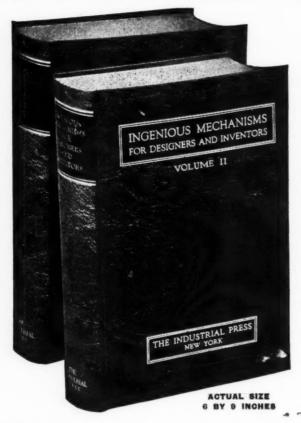
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10"x20" Pratt & Whitney Bench, m.d. 14"x6' American Geared Head, m.d., taper,

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14"x8' Pratt & Whitney, cone, motorized.

16"x6' Lodge & Shipley Selective Head, m.d., taper.

16"x8' American, cone, taper.

16"x8' Cincinnati, m.d., taper, geared head, latest type.

16"x10' Hendey Geared Head, m.d., taper.

16"x12' Lodge & Shipley Patent Head, m.d.

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18"x30" centers Hendey Geared Head, m.d. in base, latest type.

18"x6' Mueller, cone.

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18"x8' Rockford, cone.

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36"x10' Putnam, cone.

66"x12' Wright, cone

36"x28'6" Niles H.D. Geared Head, m.d.,

36"x21' centers Putnam Geared Head, m.d.

36"x32" Putnam Geared Head, m.d.

36"x36'6" Niles H.D. Geared Head, m.d.,

42"x26' American Geared Head, m.d.

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No. 3B Brown & Sharpe, m.d.

No. 3B Milwaukee Double Overarm, m.d.

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No. 4B Brown & Sharpe, m.d.

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6" Pratt & Whitney vertical shaper 16" Ohio shaper 16" & 24" G. & E. shapers 36" Morton draw cut shaper 24"x24"x6' Gray planer 36"x36"x10' Hamilton planer SEND FOR COMPLETE LIST.

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- 53" NILES-BEMENT-POND 2 swivel
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 26"x10' LIBBY with 7½" hole through spindle pan bed. Power rapid traverse, AC or DC.

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- NO. 2 CINCINNATI Vertical adjustable head.
- NO. 3-B MILWAUKEE Double Overarm, Plain.
- NOS. 2 and 3 CINCINNATI High Power, Vertical.
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42"x26"x12' INGERSOLL Planer Type milling machine with two heads on adjustable rail and two side heads, AC. DC.

PLANERS

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- 48"x48"x15' NILES-BEMENT-POND Heavy with two heads on rail and two side heads. 230 Volt DC revers-ing type planer motor and control.
- "x48"x24' NILES-BEMENT-POND Heavy with two heads on rail and two side heads. 230 Volt DC revers-ing type planer motor and control.
- 48"x48"x32' G. A. GRAY Spiral Drive with two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.
- 72"x72"x15' N-B-P, 4 heads, double deck, 230 V., DC.
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- 20" SELLERS crank slotter, 48" circular table, AC or DC.

MISCELLANEOUS

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- Planer. 30'x76" NILES-BEMENT-POND Plate Bending Rolls, pyramid type.



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4-#3 Barber Coleman Precision
Hobber
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4-#16-C-16 Bryant Heavy Duty
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4-12" x 42" Jones & Lamson External 3-12" x 30" Jones & Lamson Internal 3-#33 Excello External 2-#31 Excello External

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4-Gear, Pratt & Whitney 10",
2 wheel
8-Excello Carbide
4-Sellers Tool
2-Vinco, gear, tooth and spline
4-Fitchburg, spline

4-Fitchburg, spline

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2-10" x 20" Monarch 16 speed geared

head
3-16" x 30" Monarch 16 speed geared head
2-22" x 72" Monarch 16 speed geared head
4-22"-36" x 72" Monarch raised to -22" -36" x 72" Monarch raised to swing 36", 16 speed geared head -South Bend 9"-16"

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MILLS

MILLS
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12—Cincinnati Hydrotel 28-60
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2—Cincinnati 56-72 Hydromatic 8—Van Norman #36V

4—Milwaukee #1248 Vert. Simplex 4—Cincinnati 4-48 Hydromatic 2—Cincinnati #2 Vertical HSDT 2—Cincinnati 1-18 Plain Auto.

4—Milwaukee #2K Universal 2—Cincinnati #3 Vertical HSDT 2—Cincinnati #3 Vertical HSDT 2—Cincinnati 5-60 Hydromatic 4—Cincinnati 3-36 Hydromatic 3—Milwaukee 2 KM Plain 3—Cincinnati #2 MH Univ. 2—Brown & Sharpe #2A Univ.

2-Brown & Sharpe #2A Univ. 3-Brown & Sharpe #2 Vert. 4-#4H Milwaukee plain

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6-36" Bullard Vertical Turret 1—#25A Defiance, Horizontal

MISCELLANEOUS

Boring Machines, single and double end Excello end Excello
Boring Machines #61A Excello
Boring Machines, Heald single and
double spindle
Buffing Machines Lapping Machines, Excello, Norton Magnaflux Units

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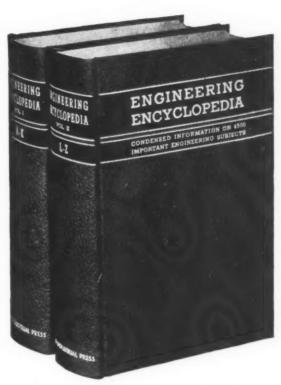
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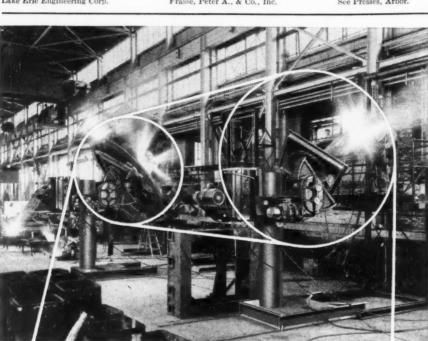
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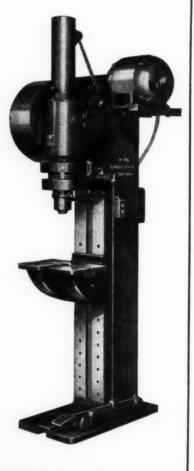
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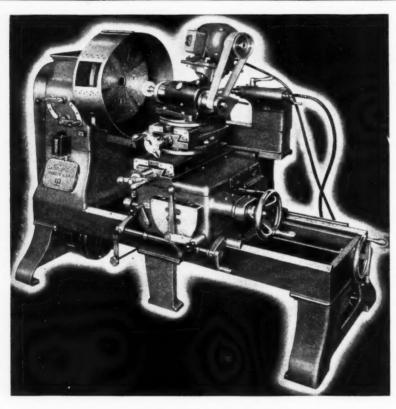
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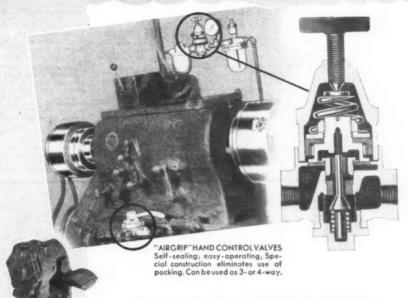
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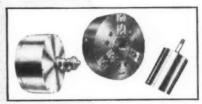
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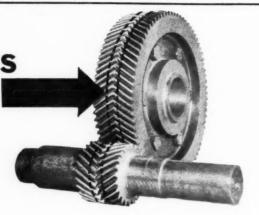
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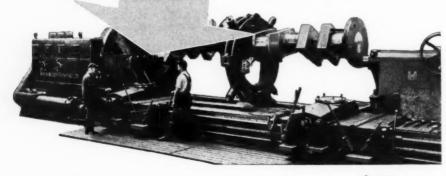


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Sossner Tap & Tool Corp.
Starrett, L. S., Co.
Vinco Corporation
Woodworth, N. A., Co.

GASKETS Garlock Packing Co. Raybestos-Manhattan, Inc., Manhattan-Rubber Div.

GEAR BLANKS, Non-Metallic Braun Gear Co. Ganschow Gear Co. General Electric Co. Westinghouse Electric Corp.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

AND EQUIPMENT
Brown & Sharne Mfg. Co.
Fellows Gear Shaper Co.
Gleason Works
Illinois Tool Works
Michigan Tool Co.
National Broach & Mch. Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Vinco Corporation

GEAR CUTTING MACHINES.

Bevel (Generator) Bilgram Gear & Machine Wks. Gleason Works

(Rotary Cutter) Newark Gear Cutting Machine Co. Producto Machine Co. Waltham Mch. Wks.

GEAR CUTTING MACHINES, Helical and Spur (Hob)

Barber-Colman Co. Lees-Bradner Co. Newark Gear Cutting Machine Co. New Jersey Gear & Mfg. Co. (Shaper or Planer Type)

Farell-Birmingham Co., Inc. Fellows Gear Shaper Co.

Shear-speed Type Michigan Tool Co.

GEAR CUTTING MACHINES, Spiral-Bevel

Gleason Works

GEAR CUTTING MACHINES.
Worm and Worm Wheels
Barber-Colman Co.
Fellows Gear Shaper Co.
(Straight and Hourglass Type)
Lees-Bradner Co.
New Jersey Gear & Mfg. Co.
Producto Machine Co.

GEAR FINISHING MACHINES Fellows Gear Shaper Co. Michigan Tool Co.

GEAR GRINDING MACHINES Fitchburg Grinding Mch. Corp. Gleason Works Pratt & Whitney Co. Vinco Corporation

GEAR HARDENING MACHINES Fellows Gear Shaper Co. Gleason Works

GEAR LAPPING MACHINES

Fellows Gear Shaper Co. Gleason Works Michigan Tool Co. National Broach & Mch. Co. GEAR MOTORS

See Speed Reducers GEAR SHAVING MACHINES

Fellows Gear Shaper Co. National Broach & Mch. Co. GEAR TESTING MACHINERY

BEAR TESTING MACHINERY
Baldwin-Southwark Corp.
Brown & Sharpe Mfg. Co.
Frarel-Birmingham Co., Inc.
Fellows Gear Shaper Co.
Lees-Bradner Co.
Newark Gear Cutting Machine Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Vinco Corp.

GEAR TOOTH GRINDING MCHS. Gear Grinding Machine Co. Lees-Bradner Co. Pratt & Whitney Co.

GEAR TOOTH GRINDING REST Utility Tool & Mfg. Co.

GEARS, Cut Atlantic Gear Works, Inc. Automotive Gear Works, Inc. Baush Machine Tool Co. Beaver Gear Works, Inc. Bethlehem Steel Co.
Bilgram Gear & Machine Works
Boston Gear Works, Inc.
Braun Gear Co.
Clincinnati Gear Co.
Cleveland Worm & Gear Co.
DeLaval Steam Turbine Co.
Detroit Bevel Gear Co.
Diefendorf Gear Corp.
Earle Gear & Mch. Co.
Eberhardt-Denver Co.
Fairfield Mfg. Co.
Fairfield Mfg. Co.
Fairfield Mfg. Co.
Fairfield Mfg. Co.
Gear Specialties
General Electric Co.
Glesson Works
Grant Gear Wish, Inc.
Hartford Special Mchy. Co.
Illinois Gear & Machine Co.
Lees Braffiner Co.
Missel Press Mfg. Co.
Michigan Tool Co.
New Jersey Gear & Mg. Co.
Ohio Gear Co.
Perkins Mch. & Gear Co.
Philadelphia Gear Works
Fitsburgh Gear & Machine Co.
Stahl Gear & Machine Co.
Taylor Mch. Co.
Westinghouse Electric Corp.
Molded
Philadelphia Gear Works Molded

Philadelphia Gear Works Westinghouse Electric Corp. Rawhide and Non-Metallic

Rawhide and Non-Metali
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Braun Gear Co.
Cincinnati Gear Co.
Diefendorf-Gear Corp.
Earle Gear & Mch. Co.
General Electric Co.
General Electric Co.
Grant Gear Works, Inc.
Hartford Special Mchy. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Philadelphia Gear Works
Pittsburgh Gear & Machine Co.
Stahl Gear & Machine Co.
Taylor Mch. Co.
Westinghouse Electric Corp.

GENERATORS, ELECTRIC

General Electric Co. Janette Mfg. Co. Reliance Electric & Mfg. Co. Westinghouse Electric Corp. GOGGLES

American Optical Co. GRADUATING MACHINES

Gorton, George, Mch. Co. Noble & Westbrook Mfg. Co.

GREASE Cities Service Oil Co. Gulf Oil Corp. Shell Oil Co., Inc. Standard Oil Co. (Indiana) Sun Oil Co. Texas Co.
Tide Water Associated Oil Co.

GRINDERS, Carbide Tool Baldor Electric Co. Oliver Instrument Co. Sundstrand Mch. Tool Co.

Die and Mold Consolidated Mch. Tool Corp. Dumore Co. Haskins, R. G., Co. Pratt & Whitney Co.

Olistone, for Woodworking Tools Mummert-Dixon Co.

Pneumatic Ingersoll-Rand Co. Madison-Kipp Corp. Rotor Tool Co.

Portable Electric and Toolpost

Dumore Co. Haskins, R. G., Co. GRINDING MACHINES

Abrasive Belt

Do All Co.
Hill Acme Co.
Mattison Mch. Wks.
Porter-Cable Machine Co.
Production Machine Co.
Walker-Turner Co., Inc.
Walls Sales Corp. Rench

Atlas Press Co. Hardinge Brothers, Inc. Rivett Lathe & Grinder, Inc. Ryerson, Joseph T., & Son, Inc. Walker-Turner Co., Inc. Broach

Gear Grinding Machine Co. Camshaft

Landis Tool Co. Norton Co.

Carbide Tool

Carholoy Co., Inc. Ex-Cell-O Corp. Hager, E. F., & Son Oliver Instrument Co.

Centerless

Cincinnati Grinders, Inc. Heald Machine Co. Landis Tool Co. Chaser, or Die

Eastern Mch. Screw Corp. Fitchburg Grinding Mch. Corp. Geometric Tool Co. Landis Machine Co., Inc.

Chucking Bryant Chucking Grinder Co. Fitchburg Grinding Mch. Corp. Crankshaft

Landis Tool Co. Norton Co.

Cylinder Bryant Chucking Grinding Co. Heald Machine Co. Landis Tool Co.

Cylindrical Cylindrical
Arter Grinding Machine Co.
Brown & Sharpe Mfg. Co.
Cincinnati Grinders, Inc.
Fitchburg Grinding Mch. Corp.
Landis Tool Co.
Modern Tool Wks.
(Cons. Mch. Tool Corp.)
Morse Twist Drill & Mch. Co.
Norton Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Thompson Grinder Co.

Disc Besly, Chas. H., & Co. Gardner Machine Co. Hanchett Mfg. Co. Porter-Cable Machine Co. Production Mch. Co.

Drill

Covel Mfg. Co. Gallmeyer & Livingston Co. Oliver Instrument Co. Union Twist Drill Co.

Abrasive Mch. Tool Co. Hanchett Mfg. Co. Oliver Instrument Co. Flexible Shaft

See Flexible Shaft Equipment. For Sharpening Turning and Planing Tools

Oliver Instrument Co. Production Mch. Co. Walker, O. S., Co., Inc. Waltham Mch. Wks. Internal

Internal
Bryant Chucking Grinder Co.
Heald Machine Co.
Landis Tool Co.
Modern Tool Wks.
(Cons. Mch. Tool Corp.)
Rivett Lathe & Grinder, Inc.

Jig

Moore Special Tool Co., Inc. Knife and Shear Blade

Bridgeport Safety Emery Wheel Co., Inc. Hill Acme Co.

Piston Ring

Arter Grinding Machine Co. Bridgeport Safety Emery Wheel Co., Inc. Heald Machine Co. Profile

Boyar-Schultz Corp Pulleys Abrasive Mch. Tool Co. Radial, Ball Race, Etc. Landis Tool Co.

Radius, Link Consolidated Mch. Tool Corp. Sundstrand Mch. Tool Co.

Ring Wheel

Bealy, Chas. H., & Co.
Bridgeport Safety Emery Wheel Co., Inc.
Gardner Machine Co. Roll

Farrel-Birmingham Co., Inc. Landis Tool Co. Norton Co.

Spline

Fitchburg Grinding Machine Corp. Gear Grinding Machine Co. Vinco Corporation Surface

Burlace
Abrasive Mch. Tool Co.
Arter Grinding Machine Co.
Blanchard Mch. Co.
Brown & Sharpe Mfg. Co.
Covel Mfg. Co.
DoAll Co.
Foote-Burt Co.
Gallmeyer & Livingston Co.
Gardner Mch. Co.
Heald Machine Co.
Heald Machine Co.
Hill Acme Co.
Mattison Machine Works
Norton Co.
Pratt & Whitney Co.
Producto Machine Co.
Reid Bros. Co., Inc.
Robot Machiner Co.
Thompson Grinder Co.
Walker, O. S., Co., Inc.
Swing Frame
Raybestos Manhattan, Inc.,

Raybestos-Manhattan, Inc., Manhattan-Rubber Div.

Ex-Cell-O Corp. Jones & Lamson Mch. Co.

Thread

Ex-Cell-O Corp.
Jones & Lamson Mch. Co.
Landis Machine Co., Inc.

Universal, for Sharpening Cutters, Reamers, Hobs, Etc.

Universal, for Sharpening Gut.

Reamers, Hobs, Etc.

Barber-Colman Co.

Brown & Sharpe Mfg. Co.

Cincinnati Milling Mch. Co.

Covel Mfg. Co.

DoAll Co.

Fellows Gear Shaper Co.

(Helical Gear Shaper Cutters)

Fitchburg Grinding Mch. Corp.

Gallmeyer & Livingston Co.

Ingersoil Milling Mch. Co.

Landis Tool Co.

Landis Tool Co.

Lee, K. O., & Son Co.

Norton Co.

Oliver Instrument Co.

Tratt & Whitney Co.

Thompson Grinder Co.

Union Twist Drill Co.

Gear Grinding Machine Co. Jones & Lamson Mch. Co. Pratt & Whitney Co.

GRINDING WHEELS

Bakelite Corp.
Bay State Abrasive Co.
Besly, Chas. H., & Co.
Blanchard Mch. Co.
Bridgeport Safety Emery Wheel Co., Inc.
Carbornudum Co.
Electro Refractories & Alloy Corp. Electro Retractories & Alloy Norton Co. Pines Engineering Co., Inc. Raybestos-Manhattan, Inc., Manhattan-Rubber Div. Simonds Abrasive Co. Simonds Worden White Co. Vitrifled Wheel Co.

GROOVING TOOL, INTERNAL

Waldes Kohinoor, Inc.

HAMMERS, Drop Bliss, E. W., Co. Chambersburg Engineering Co. Morgan Engineering Co. Pneumatic

Madison-Kipp Corp.

McKiernan-Terry Corp. Quickwork-Whiting Div. of Whiting Corp. Soft

Chambersburg Engineering Co. S. & H. Soft Hammer Products Co. Steam

Chambersburg Engineering Co.

HANGERS, Shaft Boston Gear Works, Inc.
Hill Acme Co.
Hyatt Bearings Div. General Motors
Sales Corp.
SK F Industries, Inc.
Standard Pressed Steel Co.

HARDENING EQUIPMENT, Induction
Ohio Chankshaft Co.

HARDNESS TESTING INSTRUMENTS

Shore Instrument & Mfg. Co. Wilson Mechanical Instrument Co., Inc.

HEADING MACHINES

Cook, Asa S., Co. National Machinery Co.

HEAT TREATMENT OF STEEL

Bennett Metal Treating Co. Davis Boring Tool Div. Ohio Gear Co.
Perfection Tool & Metal Heat
Treating Co.
Pittsburgh Gear & Mch. Co.

HORRING MACHINES

See Gear Cutting Machines, Hotcal and Spur (Hob), and Gear Cutting Machines, Worm and Worm Worls.

HORS

HOBS
Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Lees-Bradner Co.
Michigan Tool Co.
National Twist Drill & Tool Co.
New Jersey Gear & Mfg. Co.
Sossner Tap & Tool Corp.
Union Twist Drill Co.
U. S. Machine Tool Mfg. Corp.

HOIST HOOKS

American Chain Ladder Co. Bethlehem Steel Co. Williams, J. H., & Co.

HOISTING AND CONVEYING MACHINERY Shepard Niles & Hoist Corp.

HOISTS, Air

Hanna Engineering Works Ingersoll-Rand Co.

Chain, Etc.

Ryerson, Joseph T., & Son, Inc.

Electric Philadelphia Gear Works Shepard Niles Crane & Hoist Corp.

HONES

Carborundum Co.
General Tool & Die Co.
Micromatic Hone Corp.
Moline Tool Co.
National Diamond Hone & Wheel Co.
Sunnen Products Co.

HONING MACHINES, Internal (Cylinder)
Barnes Drill Co.
Barnes, W. F. and John, Co.
Micromatic Hone Corp.
Moline Tool Co.
Sunnen Products Co.

HONING MACHINES, External Barnes Drill Co. Micromatic Hone Corp.

HOSE, Leather, Rubber, Metallic, Etc. American Metal Hose Div., American Brass Co. Raybestos-Manhattan, Inc., Manhattan-Rubber Div.

HYDRAULIC MACHINERY, Tools and Equipment
Baldwin-Southwark Corp.
Barnes, John S., Corp.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Bilss, E. W., Co.
Chambersburg Engineering Co.
Cross Co. Billis, E. W., Co.
Chambersburg Engineering Co.
Cross Co.
Denison Engineering Co.
Elmes Engineering Works
Farquhar, A. B., Co.
Hydraulic Press Mfg. Co.
Hydraulic Press Mfg. Co.
Hydraulic Products Co.
Hydraulic Products Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Parker Appliance Co.
Rockford Machine Tool Co.
Sundstrand Mch. Tool Co.
Watson-Stillman Co.

HYDRAULIC POWER UNITS OR TOOL HEADS
Barnes Drill Co.
Barnes, John S., Corp.
Barnes, W. F. and John, Co.
Ex-Cell-O Corp.
Hannifin Mfg. Co.
Hydraulic Products Co.
National Automatic Tool Co.

HYDRAULIC, Tool Head or Power Unit Barnes Drill Co.
LeMaire Tool & Mfg. Co.
New Britain-Gridley Mch. Div.
New Britain Machine Co.

INDEX CENTERS

Abrasive Mch. Tool Co. Brown & Sharpe Mfg. Co. Kempsmith Mch. Co. Vinco Corporation

INDEXING and Spacing Fixtures

Hartford Special Mchry. Co. Vinco Corporation Zagar Tool, Inc.

INDICATORS, Dial

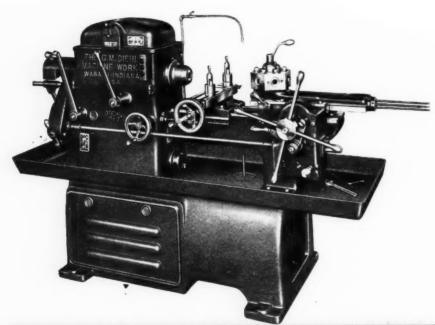
Ames, B. C., Co. Brown & Sharpe Mfg. Co. Federal Products Corp. Standard Gage Co., Inc. Starrett, L. S., Co.

are designed and built for smooth accurate cutting to rigid specifications and are unsurpassed for high speed precision performance. Standard in size and work alongside other lathes of standard make, using same tooling, including collets. Note these specifications:

> **Automatic Chuck** Capacity (round).....1" Swing-over Cross Slide 6" and reverse

Swing-over bed 14" Six speeds . . . forward

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ol Co.
n & Sharpe Mfg. Co.
rett, L. S., Co.
er-Root, Inc.
Test

EL

n & Sharpe Mfg. Co. ral Products Corp. dard Gage Co., Inc. rett, L. S., Co.

INGOTS, Manganese, Bronze and Brass mp Brass & Iron Foundries Div.

INTENSIFIERS, Hydraulic

Baldwin-Southwark Corp. Elmes Engineering Works Farquhar, A. B., Co. Hydraulic Press Mfg. Co. Morran Engineering Co. Watson-Stillman Co.

JACKS, Planer

Armstrong Bros. Tool Co.

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

American Measuring Instruments Corp. American Measuring Instrument American Type Founders, Inc. Columbus Die, Tool & Mch. Co. Ex-Cell-O Corp. Hartford Special Mchry. Co. Ingersoll Milling Mch. Co. Logansport Machine Co., Inc. Merz Engineering Co. Sossner Tap & Tool Corp. Sundstrand Mch. Tool Co. U. S. Machine Tool Mfg. Corp. Vinco Corporation Wade Tool Co.

KEYSEATERS

Baker Bros., Inc. Consolidated Mch. Tool Corp. Davis Keyseater Co. Lapointe Machine Tool Co.

KNURL HOLDERS

Brown & Sharpe Mfg. Co. Graham Mfg. Co., Inc. Pratt & Whitney Co.

KNURLING TOOLS

Armstrong Bros. Tool Co. Graham Mfg. Co., Inc. Pratt & Whitney Co. Williams, J. H., & Co.

LAMINATED SHAPES

Andover Kent Corp.

LAPPING MACHINES

Cincinnati Grinders, Inc. Ex-Cell-O Corp. Fellows Gear Shaper Co. Norton Co.

LATHE ATTACHMENTS

LATHE ATTACHMENTS

American Tool Wks. Co.
Atlas Press Co.
Bradford Machine & Tool Co.
Gisholt Mch. Co.
Jones & Lamson Mch.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
McCrosky Tool Corp.
Monarch Mch. Tool Co.
Newton Mig. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
South Bend Lathe Wis,, Inc.
Springfield Mch. Tool Co.
Sundstrand Mch. Tool Co.
Sundstrand Mch. Tool Co.
Sundstrand Mch. Tool Co. ark Tool Co. ndstrand Mch. Tool Co. ade Tool Co. arner & Swasey Co.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co. Williams, J. H., & Co.

LATHES

R

Automatic

and Machine Co. and Machine Co.

res Co.

sholt Meh. Tool Co.

Axles and Shaft

axies and Shaft
dissolidated Mch. Tool Corp.
diss Co.
dige & Shipley Mch. Tool Co.
distrand Mch. Co.
distrand Mch. Tool Co.

Bench

mes, B. C., Co.
tlas Press Co.
in Tool Wks., Inc.
crdinge Brothers, Inc.
eBlond, R. K., Mch. Tool Co.
catt & Whitney Co.



Aluminum Bronze Rods-extruded by Ampco

...for higher strength...good surface finish...compact structure

. . . result in a better product for your customer

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Specialists in engineering production — finishing of copper-base alloy parts.

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Ampco Metal, Inc.

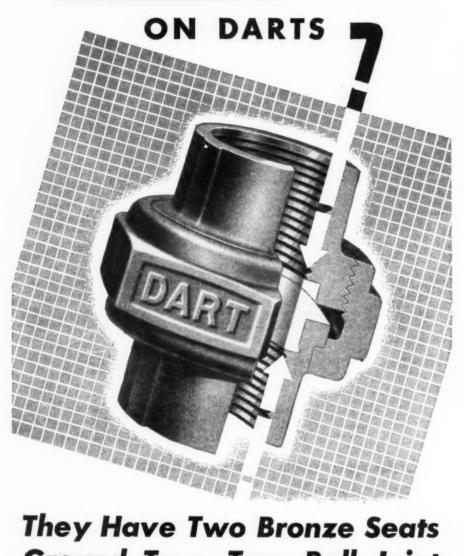
Department M-2

Milwaukee 4, Wisconsin

Ampco Field Offices in Principal Cities

A-23

IMPORTANT DATA



They Have Two Bronze Seats Ground To a True Ball Joint

The importance of this exclusive Dart feature is in that it permits the union to make a drop-tight connection without freezing the seats. Darts may be uncoupled instantly whenever needed for further service. Bodies and nuts are made of hightest air-refined malleable iron — are practically indestructible.

For long, trouble-free service—and consequent low cost—always specify Darts.

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Rivett Lathe & Grinder, Inc. Seneca Falls Mch. Co. Sheldon Mch. Co. South Bend Lathe Wks.

Gisholt Mch. Co. LeBlond, R. K., Mch. Tool Co. Lodge & Shipley Mch. Tool Co. Wickes Bros.

Brass Workers

Acme Machine Tool Co. Bardons & Oliver, Inc. Gisholt Mch. Co. Seneca Falls Mch. Co. Springfield Mch. Tool Co. Warner & Swasey Co.

Crankshaft

Consolidated Mch. Tool Corp. Cross Co.
LeBlond, R. K., Mch. Tool Co.
Sundstrand Mch. Tool Co.
Wickes Bros.

Double-End

Consolidated Mch. Tool Corp. Sundstrand Mch. Tool Co. Wickes Bros.

Engine and Toolroom

Engine and Toolroom
Acme Machine Tool Co.
American Tool Wks. Co.
Atlas Press Co.
Atlas Press Co.
Axelson Manufacturing Co.
Bradford Machine Tool Co.
Consolidated Mch. Tool Corp.
Hendey Machine Co.
LeBlond, R. K., Mch. Tool Co.
LeBmann Machine Co.
Logan Engineering Co.
Monarch Mch. Tool Co.
Monarch Mch. Tool Co.
Monarch Mch. Tool Co.
Mrey Machinery Co., Inc.
Pratt & Whitney Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Sence Falls Mch. Co.
Sidney Machine Tool Co.
Simmons Machine Tool Co.
Simmons Machine Tool Cop.
South Bend Lathe Wks.
Springfield Mch. Tool Co.
Wickes Bros.

Extension Bed and Gap

Extension Bed and Gap

Gisholt Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Seneca Falls Mch. Co.
South Bend Lathe Wks.
Warner & Swasey Co.

Gun

Consolidated Mch. Tool Corp. LeBlond, R. K., Mch. Tool Co. Lodge & Shipley Mch. Tool Co. Seneca Falls Mch. Co. Springfield Mch. Tool Co. Wickes Bros.

Manufacturing Type

Lipe-Rollway Corporation Lodge & Shipley Mch. Tool Co.

Spinning

See Chucking Machines.

Toolroom

See Lathes, Engine and Toolroom.

Turret

Acme Machine Tool Co.

Acme Machine Tool Co.
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Bullard Company
Diehl, G. M., Machine Wks.
Foster Div., International Detrola Forp.
Gisholt Mch. Co.
Hardinge Brothers, Inc.
(Bench or Cabinet Mounting)
Jones & Lamson Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Morey Machinery Co.
National Acme Co.
Oster Mfg. Co.
Potter & Johnston Mch. Co.
Production Machine Co.
Rivett Lathe & Grinder, Inc.
Simmons Machine & Tool Corp.
South Bend Lathe Wks., Inc.
Springfield Mch. Tool Co.
Stark Tool Co.
Wade Tool Co.
Wade Tool Co.
Warner & Swasey Co.

Turret Automatic

Turret Automatic

Potter & Johnston Mch. Co. Vertical Turret

Bullard Company Rogers Machine Works, Inc. LEVELS

Pratt & Whitney Co. Starrett, L. S., Co. Universal Boring Mch. Co.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants
Cities Service Oil Co. Gulf Oil Corp. Shell Oil Corp. Shell Oil Co., Inc. Sinclair Refining Co.
Socony Vacuum Oil Co., Inc. Standard Oil Co. (Indiana) Stuart, D. A., Oil Co., Ltd. Sun Oil Co.
Texas Co. Texas Co. Tide Water Associated Oil Co.

LUBRIC TING SYSTEMS

Madison app Corp. Rivett I. ac & Grinder, Inc.

MACHINISTS' SMALL TOOLS

See Call A. Hammers, Wrenches, Drill Paps, Etc.

MAGNEHUM cal Co.

MANDRILS

See Arle and Mandrels.

MARKING MACHINES AND

Colonial Broach Co. Noble & Westbrook Mfg. Co. Sossher Meel Stamps

MEASURING MACHINES AND

Federal Products Corp. Hanson-Whitney Mch. Co. Norma-Heffmann Bearings Corp. Norma-Hedfmann Bearin Pratt & Whitney Co. Scherr, George, Co., Inc. Van Keuren Co.

MEASURING WIRES, Thread, Spline and Gear

Van Keuren Co.

METALS, Bearing

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METALS, Perforated

Chicago Perforating Co.

See Recording Instruments.

MICROMETERS

Bath, John, & Co., Inc. Brown & Sharpe Mfg. Co. Davis & Thompson Co. Pratt & Whitney Co. Scherr, George, Co., Inc. Starrett, L. S., Co. Van Keuren Co.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Cc.
Consolidated Mch. Tool Corp.
Elsin Tool Wks., Inc.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kempsmith Mch. Co.
Porter Cable Machine Co.
Reed-Prentice Corp.
Rivet Lathe & Grinder, Inc.
Sundstrand Mch. Tool Co.
Van Norman Co.

MILLING MACHINES

Automatic

Cincinnati Milling Machine Co. Consolidated Mch. Tool Corp. Cross Co.
Ingersoll Milling Mch. Co.
Jones & Lamson Mch. Co.
Kearney & Trecker Corp.
Sundstrand Mch. Tool Co.
U. S. Tool Company, Inc.

Bench

Ames, B. C., Co.
Atlas Press Co.
Burke Machine Tool Co.
Hardine Brothers, Inc.
(Bench or .Pedestal Type)
Pratt & Whitney Tool Co.
Stark Tool Co.

Circular Continuous

solidated Mch. Tool Corp. Cross C., Davis & Ingersol Kearney Thompson Co.

Milling Mch. Co.

A Trecker Corp.

Milling Mch. Tool Co.

Die Sinking

See Die stoking Machines. Duplex

Milling Machine Co.

Trecker Corp.

Hand

Hand
line Tool Co.
line Co.
H., & Sons
Mch. Tool Co.
an Co.

ental, Plain and Universal

arpe Mfg. Co.
Milling Machine Co.
Mch. Tool Corp. Jachine Tool Co.

ine Co.
orge, Mch. Co.
dilling Mch. Co.
Trecker Corp.
Mch. Co.
Se Son, Inc.
Mfg. Co.
Ine Tool Co.
Inchine Co.

Sidney Machine Tool Co. Simmons Machine Tool Corp. Sundstrand Mch. Tool Co. Van Norman Mch. Tool Co. Lincoln Type

Brown & Sharpe Mfg. Co. Sundstrand Mch. Tool Co.

Planer Type Cincinnati Pianer Co.
Consolidated Mch. Tool Corp.
Davis & Thompson Co.
Ingersoil Milling Mch. Co.
Kearner & Trecker Corp.
Stokerunit Corp.
Planetary

Planetary

Co.

Cross Gear & Machinery Co. Plan-O-Mill Corp.

Ram Type, Universal Van Norman Co.

Vertical

Brown & Sharpe Mig. Co. Cincinnati Milling Machine Co. Consolidated Mch. Tool Corp. Consolidated Mch. Tool Co Cross Co. Do All Co. Gorton, George, Mch. Co. Ingersoll Milling Mch. Co. Kearney & Trecker Corp. Machinery Mfg. Co. Pratt & Whitney Co. Pratt & Whitney Co. Sidney Machine Tool Co. Sundstrand Mch. Tool Co. Taylor & Fenn Co.

MODEL AND EXPERIMENTAL

See Special Machinery Tools.

MOLD AND DIE COPYING MACHINES

Gorton, George, Mch. Co.

MOLDING MACHINES, Plastic Products Hydraulic Press Mfg. Co. Reed-Prentice Corp. Watson-Stillman Co.

MOLVBDENUM

Climax Molybdenum

MOTORS, Electric

MOTORS, Electric
Baldor Electric Co.
Dumore Co.
General Electric Co.
Janette Mfg. Co.
Lincoln Electric Co.
Lincoln Electric Co.
Reliance Electric & Engrg. Co.
Star Electric Motor Co.
Wagner Electric Corp.
Westinghouse Electric Corp.

MOUNTINGS, RUBBER, JOINTS AND COUPLINGS

Lord Manufacturing Co.

MULTIPLE-SLIDE FORMING MACHINES

Baird Machine Co. U. S. Tool Co., Inc.

NAME PLATES

Noble & Westbrook Mfg. Co.

NIBBLING MACHINES

Campbell, Andrew C., Div., American Chain & Cable Co., Inc. Gray Machine Co.

NICKEL

International Nickel Co.

NIPPLE THREADING MACHINERY

Landis Mch. Co., Inc. Oster Manufacturing Co.

NUMBERING MACHINES Noble & Westbrook Mfg. Co.

NUT MAKING MACHINERY

National Machinery Co.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap Parker-Kalon Corp. Republic Steel Corp. (Union Drawn Steel Div.)

NUTS. Self-Locking

Elastic Stop Nut Corp. of America

NUTS, Thumb or Wing and Cap

Manufacturers Screw Products Republic Steep Corp., (Union Drawn Steel Div.) Williams, J. H., & Co.

OIL CAPS

Besly, Chas. H., & Co. Gits Bros. Mfg. Co. Trico Fuse Mfg. Co.

OIL EXTRACTORS

DeLaval Separator Co.

OIL GROOVERS

Hanson-Whitney Mch. Co. OIL HOLE COVERS Gits Bros. Mfg. Co.

OILERS AND LUBRICATORS

Gits Bros. Mfg. Co. Madison-Kipp Corp. Trico Fuse Mfg. Co.

OILS, Cutting

Cimcool Div., Cincinnati Milling Machine Co. Cities Service Oil Co. Gulf Oil Corp. Shell Oil Co., Inc. Stuart, D. A., Oil Co., Ltd. Sun Oil Co. Texas Co.
Tide Water Associated Oil Co.

Lubricating

Besly, Chas. H., & Co. Cities Service Oil Co. Besly, Chas. H., & Co. Cities Service Oil Co. Gulf Oil Corp., Shell Oil Co., Inc., Sixelair Refining Co., Socony Vacuum Oil Co., Inc., Standard Oil Co. (Indiana) Stuart, D. A., Oil Co., Ltd., Sun Oil Co. Stuart, D. A., Oil Co., Ltd. Sun Oil Co. Texas Co. Tide Water Associated Oil Co.

Quenching and Tempering

Quenching and 1 cm Cities Service Oil Co. Gulf Oil Corp. Shell Oil Co., Inc. Standard Oil Co. (Indiana) Stuart, D. A., Oil Co., Ltd.

Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

ORDNANCE MACHINES, Special Rehnberg-Jacobson Mfg. Co.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Garlock Packing .Co. Raybestos-Manhattan, Inc., Manhattan-Rubber Div. Watson-Stillman Co.

PARALLELS

PARALLELS
Brown & Sharpe Mfg. Co.
Johansson Div., Ford Motor Co.
Starrett, L. S., Co.
Taft-Peirce Mfg. Co.
Walker, O. S., Co., Inc.

PATTERNS, WOOD

Mummert-Dixon Co

PHOSPHOR BRONZE-See Bronze.

PILLOW BLOCKS

Hill Acme Co. Norma-Hoffmann Bearings Corp. S K F Industries, Inc. Standard Pressed Steel Co.

PIPE, BRASS AND COPPER

American Brass Co.

PIPE CUTTING AND THREADING MACHINES

Foote-Burt Co. Landis Mch. Co., Inc. Oster Manufacturing Co.

PIPE JOINTS, SWIVEL

Chicksan Co.

PIPE, STEEL

PIPE, STEEL
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co. (U. S. Steel
Corp. Div.)
Republic Steel Corp.,
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

PIPE TONGS Williams, J. H., & Co.

PLANER ATTACHMENTS

Cincinnati Planer Co. Consolidated Mch. Tool Corp. Hanson-Whitney Mch. Co. Rockford Machine Tool Co.

PLANERS

PLANERS
Baldwin-Southwark Corp.
Cincinnati Planer Co.
Consolidated Mch. Tool Corp.
(Incl. Plate, Rotary and Crank Types)
Ohio Machine Tool Co.
Rockford Machine Tool Co.
Openside

Cincinnati Planer Co. Rockford Machine Tool Co.

PLATICS and Plastic Products Bakelite Corp. Durez Plastics & Chemicals, Inc.

PLATE ROLLS

Baldwin-Southwark Corp.
Bethlehem Steel Co.
Cleveland Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp.
Hannifn Mfg. Co.
Ryerson, Joseph T., & Son, Inc.

PLATES, Surface

Brown & Sharpe Mfg. Co.
Jones Machine Tool Wks., Inc.
Rotor Tool Co.
Scherr, George, Co., Inc.
Taft-Peirce Mfg. Co.
U. S. Tool Company, Inc.
Vinco Corporation

PNEUMATIC EQUIPMENT

Anker-Holth Mfg. Co. Bliss, E. W., Co. Hanna Engineering Works Hannifin Mfg. Co. Ingersoll-Rand Co. Logansport Machine Co., Inc.

POLISHING LATHES and Machines

Besly, Chas. H., & Co. Bridgeport Safety Emery Wheel Co., Inc. Bridgeport Safety Emery V DoAll Co. Gardner Machine Co. Production Mch. Co. Sundstrand Mch. Tool Co.

POLISHING TOOLS, Portable

Stow Mfg. Co. Strand, N. A., & Co.

PRESSES

Baldwin-Southwark Corp. Baldwin-Southwark Corp.
Dake Engine Co.
Elmes Enginecring Works
Famco Machine Co.
Farquhar, A. B., Co.
General Manufacturing Co.
Hannifin Mig. Co.
Lempeo Products, Inc.
Logansport Machine Co., Inc.
Sheldon Mch. Co.
Watson-Stillman Co.
Wilson, K. R.
Broaching

Broaching

American Broach & Mch. Co. Bliss, E. W., Co. General Manufacturing Co. Lapointe Machine Tool Co. Peck, Stow & Wilcox Co. V & O Press Co. Watson-Stillman Co.

Extrusion

Hydraulic Press Mfg. Co. Hydropress Co., Inc. Lake Eric Engineering Corp. National Machinery Co. Watson-Stillman Co.

Baird Machine Co. Baird Machine Co.
Bliss, E. W., Co.
Etna Machine Co.
Fameo Machine Co.
Fameo Machine Co.
Ningara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Taylor & Fenn Co.
V & O Press Co.

Ajax Manufacturing Co.
Baldwin-Southwark Corp.
Bettilehem Steel Co.
Bliss, E. W., Co.
Clearing Mch. Co.
Cleveland Punch & Shear Works Co.
Farquhar, A. B., Co.
Henry & Wright Mig. Co.
Hydraulie Press Mig. Co.
Hydraulie Press Mig. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Morgan Engineering Corp.
Morgan Engineering Co.
National Machinery Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
V & O Press Co.
Watson-Stillman Co.
Zeh & Hahnemann Co.
Hydraulic

Hydraulic

Hydraullc

American Broach & Mch. Co.
Baldwin-Southwark Corp.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Birdsboro Steel Fdry. & Mch. Co.
Clearing Mch. Co.
Clearing Mch. Co.
Clearing Mch. Co.
Dake Engine Co.
Denison Engineering Co.
Elmes Engineering Works
Farrel-Birmingham Co., Inc.
Farquhar, A. B., Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Hydraulic Press Mfg. Co.
Lake Erie Engineering Co.
Lapointe Machine Tool Co.
Morgan Engineering Co.
Wilson, K. R.

Percussion

Percussion Wilson, K. R.

Bliss, E. W., Co. General Manufacturing Co. Niagara Machine & Tool Wks, Zeh & Hahnemann Co.

Sheet Metal Working

Sheet Metal Working
Baldwin-Southwark Corp.
Bliss, E. W., Co.
Cincinnati Shaper Co.
Clearing Mch. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. & Tool Corp.
Famco Machine Co.
Farquhar, A. B., Co.
Henry & Wright Mfg. Co.
Henry & Wright Mfg. Co.
Hydraulic Press Mfg. Co.
L & J Press Corp.
Like Eric Engineering Corp.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Steelweld Mchry. Div. of Cleveland
Crane & Engrg. Co.
V & O Press Co.
Watson-Stillman Co.
Zeh & Hahnemann Co.

Straightening

Straightening
Baldwin-Southwark Corp.
Colonial Broach Co.
Consolidated Mch. Tool Corp.
Elmes Engineering Works
Farquhar, A. B., Co.
General Manufacturing Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Jones Machine Tool Wks., Inc.,
Lempco Products, Inc.
Morgan Engineering Co.
Springfield. Mch. Tool Co.
Watson-Stillman Co.

PRINT PAPER, BLUE, WHITE,

Ozalid Products Div. General Aniline & Film Corp.

PROFILING MACHINES

PROFILING MACHINES
Consolidated Mch. Tool Corp.
Frew Machine Co.
Gorton, George, Mch. Co.
Leland-Gifford Co., Inc.
Morey Machinery Co., Inc.
Praet & Whitney Co.
Reed-Prentice Corp.
Wade Tool Co.

PULLEYS

Boston Gear Works, Inc. Do All Co. Hill Acme Co.

Friction Clutch

Brown & Sharpe Mfg. Co. Hill Acme Co.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Ingersoil-Rand Co.
Logansport Machine Co., Inc.
Ruthman Machinery Co.
Tuthill Pump Co.
Viking Pump Co.

Hydraulic

Hydraulic
Anker-Holth Mfg. Co.
Baldwin-Southwark Corp.
Barnes, John S., Corp.
Bernes, John S., Corp.
Bethlehem Steel Co.
Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Elmes Engineering Works
Hydropress Co., Inc.
Ingersoll-Rand Co.
Lapointe Machine Tool Co.
McIntyre Co.

Sundstrand Mch. Tool Co. Tuthill Pump Co. Viking Pump Co. Watson-Stillman Co.

Pneumatic

Ingersoll-Rand Co.

Rotary

Brown & Sharpe Mfg. Co. DeLaval Steam Turbine Co. Tuthill Pump Co. Viking Pump Co.

PUNCHES AND DIES See Dies, Sheet Metal, Inc.

PUNCHES, CENTERING Cleveland Punch & Shear Works Co.

PUNCHING MACHINERY

Buffalo Forse Co.
Cincinnati Shaper Co.
Cieveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Ryerson, Joseph T., & Son, Inc.

Steelweld Mchry. Div. of Cleveland Crane & Engrg. Co. Watson-Stillman Co. Wiedemann Machine Co.

PUNCHING AND RIVETING

Hannifin Mfg. Co.

PYROMETERS

Bristol Co. Leeds & Northrup Co. Shore Instrument & Mfg. Co.

RACK CUTTING MACHINES

Gould & Eberhardt

RACKS, GEAR, CUT

RACKS, GEAR, CUT
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Brown & Sharpe Mfg. Co.
Fellows Gear Shaper Co.
Hartford Special Mchry. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Philadelphia Gear Works
Stahl Gear & Machine Co.

REAMER HOLDERS

Gairing Tool Co. Gisholt Machine Co. Landis Mch. Co., Inc. Lipe-Rollway Corporation McCrosky Tool Corp. Scully-Jones & Co. Warner & Swasey Co.

REAMERS

REAMERS
Barber-Colman Co.
Barber-Colman Co.
Carboloy Co., Inc.
Cleveland Twist Drill Co.
Columbus Die, Tool & Mch. Co.
Davis Boring Tool Div.
Ex-Cell-O Corporation
Firth-Sterling Steel Co.
Gairing Tool Co.
Gammons-Hosglund Co.
Genesser Tool Co.
Genesser Tool Co.
Gisholt Machine Co.
Greenfeld Tap & Die Corp.
Haynes Stellite Co.
Illinois Tool Wis.
Lipe-Rollway Corporation
McCrosky Tool Corp.
Morse Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Standard Tool Co.
Standard Tool Co.
Tungsten Carbide Tool Co.
Union Twist Drill Co.

Adjustable

Adjustable

Adjustable
Barber-Colman Co.
Carboloy Co., Inc.
Clereland Twist Drill Co.
Cogsdill Twist Drill Co.
Cogsdill Twist Drill Co.
Davis Boring Tool Div.
Ex-Cell-O Corporation
Davis Boring Tool Div.
Ex-Cell-O Corporation
Firth Sterling Steel Co.
Gairing Tool Co.
Gisholt Machine Co.
Greenfield Tap & Die Corp.
McCrosky Tool Corp.
Standard Tool Co.
Caft-Peirce Mfg. Co.
Union Twist Drill Co.
Taper Pin

Taper Pin

Taper Pin
Butterfield Div., Union Twist Drill Co.
Gammons-Hoaglund Co.
Greenfield Tap & Die Corp.
Lipe-Rollway Corporation
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.

REAMING MACHINES

RECORDING INSTRUMENTS For Counting

National Acme Co.

For Electricity

Bristol Co. General Electric Co. Leeds & Northrup Co.

For Pressure Bristol Co. Leeds & Northrup Co.

For Speed

Bristol Co. Leeds & Northrup Co.

For Temperature

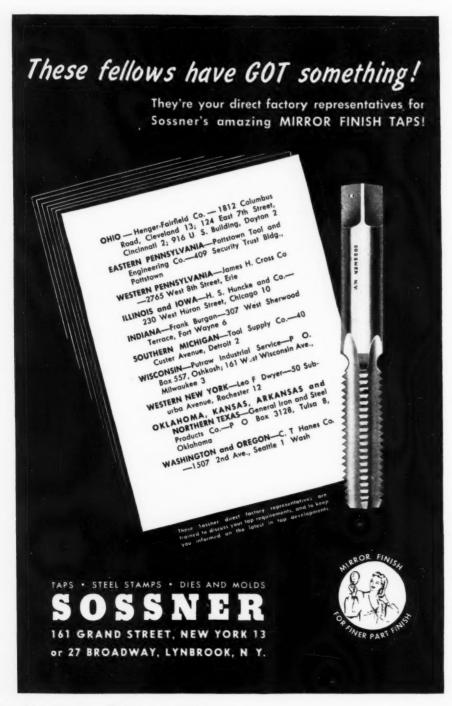
Bristol Co. Leeds & Northrup Co.

REELS, Stock, Standard and Automatic S & S Mch. Wks. U. S. Tool Company, Inc.

REFRACTORIES, Heat Treating

Norton Co.

REGULATORS, Temperature



REMOVERS, Japan, Enamel, Etc. Oakite Products, Inc.

RETAINING RINGS FOR

Wairles Kohinoor, Inc.

RHEOSTATS

Allen-Bradley Co.

RIVET SETS

Bethlehem Steel Co. Cleveland Punch & Shear Works Co.

RIVETERS, Hydraulic

Bethlehem Steel Co.
Hanna Engineering Works
Hannifn Mfg. Co.
Hydraulic Press Mfg. Co.
Morgan Engineering Co.

Preumatic

Grant Mfg. & Mch. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Ingersoll-Rand Co.
Ryerson, Joseph T., & Son, Inc.

RIVETING MACHINES

Buffalo Forge Co.
General Riveters, Inc.
Grant Mfg. & Mch. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Peck, Stow & Wilcox Co.
Producto Machine Co.

RIVET MAKING MACHINES

Hill Acme Co. National Machinery Co.

Manufacturers Screw Products Republic Steel Corp., (Union Drawn Steel Div.)

RULES, Steel

Brown & Sharpe Mfg. Co. Scherr, George, Co., Inc. Starrett, L. S., Co.

RUST PREVENTATIVE

National Oil Products Co. Oakite Products, Inc. Scherr, George, Co., Inc.

SAND BLAST FOUIPMENT

See Blast Cleaning Equipment.

SANDERS

Carborundum Co. Ingersoil-Rand Co. Porter-Cable Machine Co. Rotor Tool Co. Sand-O-Flex Corp. Sundstrand Mch. Tool Co. Walls Sales Corp.

SAW BLADES, HACK

Armstrong-Blum Mfg. Co. Simonds Saw & Steel Co. Starrett, L. S., Co.

SAW SHARPENING MACHINES

Covel Mfg. Co. Earle Gear & Mch. Co. Huther Bros. Saw Mfg. Co., Inc. Scherr, George, Co., Inc.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp. Earle Gear & Mch. Co. Etna Machine Co.

Friction

Rverson, Joseph T., & Son, Inc. Metal Cutting Band

Armstrong-Blum Mfg. Co.
A ey Drilling Machine Co.
Double Co.
Grob Brothers
Huther Bros. Saw Mfg. Co., Inc.
Eyerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.

Power Hack

Armstrong-Blum Mfg. Co. Covel Mfg. Co. Exerson, Joseph T., & Son, Inc.

SAWS, Circular Metal Cutting

aws, Circular Metal Cutting
than & Sharpe Mfg. Co.
solidated Mch. Tool Corp.
the Co.
solidated Mch. Tool Corp.
the Co.
the Bros. Saw Mfg. Co., Inc.
the Bros. Saw Mfg. Co., Inc.
the Saw & Steel Co.
the Co.
t

Metal Cutting Band

Arnstrong-Blum Mig. Co.
All Co., Inc.
Ther Bros. Saw Mig. Co., Inc.
Cerson, Joseph T., & Son, Inc.
Samewitz Works
walker-Turner Co., Inc.
Wells Manufacturing Corp.



R=S, for over 35 years has stood for Rickert-Shafer, and precision threading equipment. Over the years we have concentrated most of our attention on second operation tools, Die Heads of all kinds, Collapsible Taps and Boring Heads. We have found time to design and build thousands of Friction-type Tapping Machines and hundreds of special designed-for-the-job Threading Machines. What is your production threading problem? Write today.

RICKERT-SHAFER CO · ERIE, PA DIE HEADS . COLLAPSIBLE TAPS . BORING HEADS TAPPING MACHINES . SPECIAL THREADING MACHINES

Screw Slotting

Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Standard Tool Co.
Standard Tool Co.
Starrett, L. S., & Co.
Union Twist Drill Co.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co.

SCREW DRIVING AND NUT SETTING EQUIPMENT

SETTING EQUIPMENT Errington Mechanical Laboratory Haskins, R. G., Co. Ingersoil-Rand Co. Procunier Safety Chuck Co. Strand, N. A., & Co.

SCREW MACHINES, Automatic, Single and Multiple Spindle
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co., Cone Automatic Machine Co., Inc.
Foote-Burt Co.
Greenlee Bros. & Co.
National Acme Co.
New Britain-Gridley Mch. Div.,
New Britain Machine Co.
Scherr, George, Co., Inc.

SCREW MACHINES. Hand

SCREW MACHINES, Hand See also Lathes, Turret. Acme Machine Tool Co. Bardons & Oliver, Inc. Brown & Sharpe Mfg. Co. Gisholt Mch. Co. Hardinge Brothers, Inc. Jones & Lamson Machine Co. Rivett Lathe & Grinder, Inc. Simmons Machine Tool Corp. Stark Tool Co. Watner & Swasey Co.

SCREW MACHINE TOOLS AND EQUIPMENT

AND EQUIPMENT
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Gisholt Mch. Co.
Greenlee Bros. & Co.
Jones & Lamson Machine Co.
Landis Mch. Co. Inc.
National Acme Co.
New Britain-Gridley Mch. Div.,
New Britain-Gridley Mch. Div.,
New Britain Machine Co.
Potter & Johnston Machine Co.
R and L Tools
Warner & Swasey Co.

SCREW MACHINE WORK

Aluminum Co. of America Amon-Schulte Co. Eastern Mch. Screw Corp. Morse Twist Drill & Mch. Co. National Acme Co. Standard Pressed Steel Co.

Besly, Chas. H., & Co.
Butterfield Div. Union Twist Drill Co.
Card, S. W., Mfg. Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
Pratt & Whitney Co.

SCREWS, Cap, Set, Safety Set and Machine

SCREWS, Cap, Set, Safety Set and Machine
Allen Mig. Co.
American Screw Co.
Atlas Bolt Screw Co.
Bristol Co.
Central Screw Co.
Chandler Products Corp.
Continental Screw Co.
Corbin Screw Co.
Elco Tool & Screw Mig. Co.
Harper, H. M., & Co.
Harper, H. M., & Co.
Harper, H. M., & Co.
Manufacturers Screw Products
Milford Rivet & Machine Co.
National Acme Co.
National Lock Co.
National Lock Co.
National Lock Co.
Parker, Chas., Co.
Parker, Chas., Co.
Parker, Chas., Co.
Parker, Chas., Co.
Reading Screw Co.
Republic Steel Corp.
(Union Drawn Steel Div.)
Russell, Burdsall & Ward Bolt
& Nut Co.
Scovil Mig. Co.
Southington Hardware Co.
Standard Pressed Steel Co.
Steel Co. of Canada, Ltd.
Whitney Screw Corp.
Wolverine Belt Co.

SCREWS, Self-Tapping Drive

Manufacturers Screw Products Parker-Kalon Corp.

SCREWS, Thumb

American Screw Co. Manufacturers Screw Products Parker-Kalon Corp. Williams, J. H., & Co.

SEALS AND RETAINERS Oil or Grease

Garlock Packing Co. Gits Bros. Mfg. Co.

SEAMLESS STEEL TUBING

See Tubing, Seamless Steel.

SECOND HAND MACHINERY, Etc.

Cincinnati Machinery & Supply Co.
Eastern Machinery Co.
Goldman, Harvey & Co.
Lucas, J. L., & Son, Inc.
Miles Machinery Co.
Morey Mchry. Co., Inc.
Simmons Machine Tool Corp.

SEPARATORS, CENTRIFUGAL

DeLaval Separator Co.

SEPARATORS, Oll or Coolant

Barnes Drill Co.
National Acme Co.
Tolhurst Centrifugal Div., American
Machine & Metals, Inc.

SHAFTING, STEEL

Bethlehem Steel Co.
Commercial Forgings Co.
Coumberland Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co.
(U. S. Steel Corp., Div.)
Ryerson, Joseph T., & Son, Inc.
Standard Pressed Steel Co.

SHAFTS, FLEXIBLE

Haskins, R. G., Co. Stewart, F. W., Mfg. Co. Strand, N. A., & Co.

Hollow Bored

American Hollow Boring Co. Bethlehem Steel Co.

Turning and Ground

Bethlehem Steel Co. Cumberland Steel Co. Jones & Laughlin Steel Corp. Ryerson, Joseph T., & Son, Inc.

SHAPERS

SHAPERS

American Tool Works Co.
Atlas Press Co.
Cincinnati Shaper Co.
General Engrg. & Mfg. Co.
Hendey Machine Co.
Machinery Mfg. Co.
Ohio Machine Tool Co.
Rockford Mch. Tool Co.
Smith & Mills Co.

Vertical

Hanson-Whitney Mfg. Co.
Jones Machine Tool Wks., Inc.
Pratt & Whitney Co.
Rhodes Manufacturing Co.
Rockford Machine Tool Co.

SHAPES, Structural

Aluminum Co. of America Bethlehem Steel Co. Cramp Brass & Iron Foundries Div. Jones & Laughlin Steel Corp.

SHEARING MACHINERY

SHEARING MACHINERY
Bethlehem Steel Co.
Buffalo Forge Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Hydropress Co., Inc.
Morgan Engineering Co.
Niagara Mch. & Tool Wks.
O'Neil-Irwin Mfg. Co.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Rverson, Joseph T., & Son, Inc.
Watson-Stillman Co.
Yoder Co.

SHEARS, Alligator

Hill Acme Co.

SHEARS, Rotary
Bliss, E. W., Co.
Brown & Sharpe Mfg. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Ryerson, Joseph T., & Son, Inc.
Union Twist Drill Co.

Squaring

Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Teol Corp.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.

SHEET METALS

Aluminum Co. of America American Brass Co. Bethlehem Steel Co. Ingersoll Steel & Disc Div., Borg-Warner Corp. Ryerson, Joseph T., & Son, Inc.

SHEETS, Iron and Steel

SHEETS, fron and steel
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.,
(Uuion Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

Perforated

Chicago Perforating Co.

SHRINKING EQUIPMENT, Cold Deepfreeze Div. Motor Products Corp.

SINE BARS

Johansson Div., Ford Motor Co. Starrett, L. S., Co. Vinco Corporation

SLEEVES

SLEEVES
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

SLOTTING MACHINES

Baker Brothers, Inc. Consolidated Mch. Tool Corp. Jones Machine Tool Wks., Inc. Rockford Mch. Tool Co.

SOCKETS
Cleveland Twist Drill Co.
Greenfield Tan & Die Corp.
Morse Twist Drill & Meh. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.
Williams, J. H., & Co.

SOLDER FOR ALUMINUM AND CAST IRON

Cramp Brass & Iron Foundries Div.

SPECIAL MACHINERY AND TOOLS

SPECIAL MACHINERY AND TO American Type Foundries, Inc. Baird Machine Co. Baldwin-Southwark Corp. Barnes Prill Co. Barnes. W. F. & John. Co. Barnes W. F. & John. Co. Barnes Steel Co. Bilgram Gear & Mch. Wks. Birdsboro Steel Fdy. & Mch. Co. Blanchard Machine Co. Blanchard Machine Co. Consolidated Mch. Tool Corp. Cross Co. Consolidated Mch. Tool Corp. Cross Co. Bliss, E. W., Co.
Columbus Die, Tool & Machine Consolidated Mch. Tool Corp.
Cross Co.
Davis Boring Tool Co., Inc.
Denison Enginering Co.
Earle Gear & Mch. Co.
Elgin Tool Wks., Inc.
Ex-Cell-O Corp.
Farrel-Birmingham Co., Inc.
Gairing Tool Co.
Gisholt Mch. Co.
Gisholt Mch. Co.
Grant Mfg. & Mch. Co.
Grant Mfg. & Mch. Co.
Grant Mfg. Co.
Hannifin Mfg. Co.
Hartford Snecial Mchv. Co.
Hartford Snecial Mchv. Co.
Hydraulic Press Mfg. Co.
Indersoll Milling Mch. Co.
Jones Machine Tool Wks., Inc.
Lake Eric Engineeirng Corp.
Langelier Mfg. Co.
LeMaire Tool & Mfg. Co.
Lipe-Rollway Corporation
Moline Tool Co.
Morsan Engineering Co.
Morsan Engineering Co.
Morsan Engineering Co.
National Acme Co.
National Acme Co.
National Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
New Britain Mch. Tool Corp.
Ruthman Machinery Co.
R. & S. Mch. Works
Sundstrand Mch. Tool Co.
Union Twist Drill Co.
U. S. Tool Company, Inc.
V & O Press Co.
Wadt Tool Co.
Waltham Mfg. Wks.

SPEED REDUCERS

Atlantic Gear Works, Inc. Boston Gear Works, Inc. Cleveland Worm & Gear Co. Davis & Thompson Co.

DeLaval Steam Turbine Co., Farrel-Birmingham Co., Inc. Ganschow Gear Co. General Electric Co. Grant Gear Works, Inc. Janette Mfg. Co. Michigan Tool Co. Morse Chain Co. Philadelphia Gear Works Shepard Niles Crane & Hoist Co.

R

SPINDLES, Grinding

Ex-Cell-O Corporation Pope Machinery Corp.

SPINDLES, Hollow Bored

American Hollow Boring Co. Commercial Forgings Co.

SPINNING LATHES

See Chucking Machines.

SPRING COILING AND FORMING

Baird Machine Co.

SPROCKET CHAINS

Atlantic Gear Works, Inc. Boston Gear Works, Inc. Grant Gear Works, Inc. Morse Chain Co. Philadelphia Gear Works

SPROCKETS

Atlantic Gear Works, Inc. Boston Gear Works, Inc. Eberhardt-Denver Co. Grant Gear Works, Inc. Hartford Special Mchy. Co. Morse Chain Co. Philadelphia Gear Works

STAMPINGS. Sheet Metal

Aluminum Co. of America Quadriga Mfg. Co.

STAMPINGS, Steel

Worcester Pressed Steel Co.

STAMPS, Steel, and Marking Dies

Noble & Westbrook Mfg. Co. Pittsburgh Stamp Co., Inc. Sossner Steel Stamps

STEEL

STEEL
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carpenter Steel Co.
Carpenter Steel Co.
Frasse, Peter A., & Co., Inc.
Holliday, W. J., & Co.
Industrial Steels, Inc.
Ingersoll Steel & Disc Div.,
Borg-Warner Corp.
Jones & Laughlin Steel Corp.,
National Tube Co.
(U. S. Steel Corp., Div.)
Republic Steel Corp., (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.
Timken Roller Bearing Co.
Vanadium Alloys Steel Co., Inc.
Cold Drawn

Cold Drawn

Cold Drawn
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Firth-Sterling Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co.
(U. S. Steel Corp., Piv.)
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.
Wheelock, Lovejoy & Co., Inc.

Composite Tool and Die

Firth-Sterling Steel Co.

High Speed Tool

High Speed Tool
Allegheny Ludlum Steel Corp.
Armstrong Bros. Tool Co.
Bethlehem Steel Co.
Carpenter Steel Co.
Cleveland Twist Drill Co.
Cleveland Twist Drill Co.
Cloumbia Tool Steel Co.
Firth-Sterling Steel Co.
Firth-Sterling Steel Co.
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.
Wheelock, Lovejoy & Co., Inc.

Machine

Machine
Bethlehem Steel Co.
Holliday, W. J., & Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.,
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co., Inc.

Rustless

Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carpenter Steel Co.
Firth-Sterling Steel Co.
Ingersoll Steel & Disc Div.
Borg-Warner Corp.

Republic Steel Corp., (Union Frawn Steel Div.) Rustless Iron & Steel Corp.

Allegheny !
Bethlehen Carpenter
Eastern Star
Firth-Ster
Frasse, Polindustrial idlum Steel Corp. Steel Co. teel Co. inless Steel Corp. nless Steel Co., a Steel Co., r A., & Co., Inc., teels, Inc., rel & Disc Div., rmer Corp. Ingersoll Borg-Ingerson Cheef & Date Date Borg. Warner Corp.
National Tube Co.
(U. S. Steel Corp., Div.)
Republic Steel Corp., Clinion Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.
Wheelock, Lovejoy & Co., Inc.

Strip and Sheet

Allegheny Ludium Steel Corp.
Bethlehem Steel Co.
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Republic Steel Corp.,
(Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

Zinc, Tin and Copper Coated Strip Allegheny Ludlum Steel Corp.

STEEL ALLCYS

MING

STEEL BARS See Bars, Steel.

STEEL STOCK GROUND FLAT Brown & Sharpe Mfg. Co. Starrett, L. S., Co.

Haynes Stellite Co.

Butterfield Div., Union Twist Drill Co. Card, S. W., Mfg. Co. Greenfield Tap & Die Corp. Morse Twist Drill & Mch. Co. Oster Manufacturing Co. Pratt & Whitney Co. Standard Tool Co.

STONES, Oil or Sharpening Bay State Abrasive Co. Carborundum Co.

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Lake Eric Engineering Corp.
Morse Twist Drill & Mch. Co.
Springfield Mch. Tool Co.
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STUD SETTERS

Errington Mechanical Laboratory Modern Tool Wks. Procunier Safety Chuck Co.

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SURFACE PLATES See Plan Surface.

SWAGING MACHINES haper Co. lig. Co.

Allen-B General Lincol: Meletr Nation sy Co.

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me Co. les Crane & Hoist Corp.

TACHOMETERS Bristol Leeds &rthrup Co. Scherr, George, Co., Inc. Sticht, Herman H., Co., Inc. Veeder-Root, Inc.

TAPER PINS. STANDARD Morse Twist Drill & Mch. Co. Pratt & Whitney Co.

TAP EXTENSIONS

Allen Mfg. Co.

TAP HOLDERS

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AND DEVICES
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Baker Brothers, Inc.
Brown & Sharpe Mfg. Co.
Buth Machine Tool Co.
Detroit Tap & Tool Co.
Errington Mechanical Laboratory
Ettoo Tool Co.
Hoefer Mfg. Co.
Leland-Gifford Co.
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Modern Tool Wks.
Procunier Safety Chuck Co.

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TAPPING MACHINES

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Bush Machine Tool Co.
Bush Machine Tool Co.
Bush Machine Tool Co.
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Geometric Tool Co.
Geometric Tool Co.
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Langelier Mfg. Co.
Nodern Tool Wks.
Moline Tool Co.
Notonal Acme Co.
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Warner & Swaey Co.

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TAPS

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Besly, Chas. H., & Co.
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Geometric Tool Co.
Geometric Tool Co.
Greenfield Tap & Die Corp.
Hanson-Whitney Mch. Co.
Landis Mch. Co.
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Sossner Tap & Tool Corp.
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Threadwell Tap & Die Co.
Wood & Spencer Co.
Woodworth, N. A., Co.

Collapsing

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Fellows Gear Shaper Co.
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Landis Mch. Co., Inc.
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Modern Tool Works
Oster Manufacturing Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Rogers Machine Works, Inc.
Taft-Peirce Mfg. Co.

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U. S. Machine Tool Mfg. Corp.
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THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES See Grinding Machines, Thread.

THREAD MILLING MACHINES

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Peck, Stow & Wilcox Co.
Rolled Thread Die Co.
V & O Press Co.

TIN AND TERNE PLATES

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TOOL BITS, High Speed Steel
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Barber-Colman Co.
Carpenter Steel Co.
Firth-Sterling Steel Co.
Illinois Tool Wks.
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co., Inc.
Williams, J. H., & Co.

Special Alloy

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See Grinders for Sharpening Turning and Planing Tools.

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Gairing Tool Co.

TOOLHOLDERS

TOOLHOLDERS

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Gairing Tool Co.
Gisholt Machine Co.
Jones & Lamson Mch. Co.
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(turret)
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Rutland Tool Service

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Ryerson, Joseph T., & Son, Inc.

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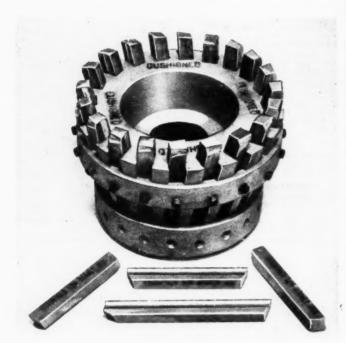
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Frasse, Peter A., & Co., Inc.
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(U. S. Steel Corp., Div.)
Ryerson, Joseph T., & Son, Inc.
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See Drills, Twist.

UNIONS

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Detachable Socket

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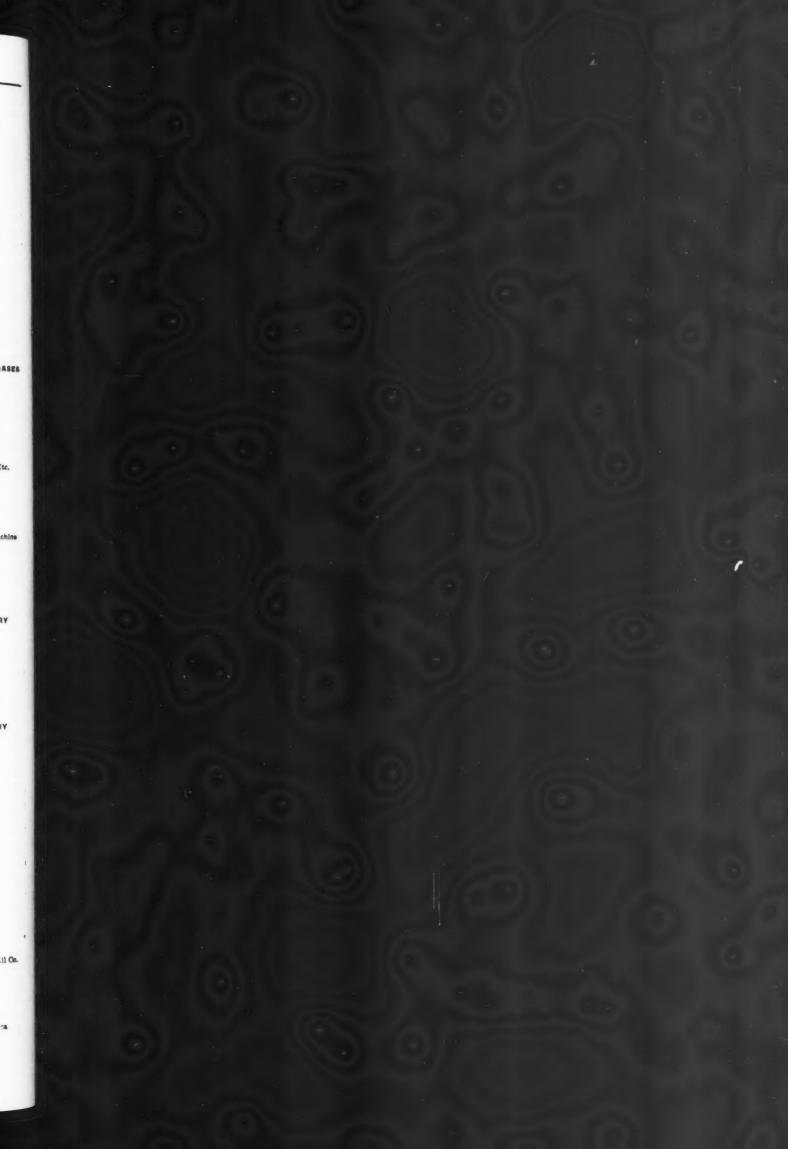
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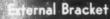




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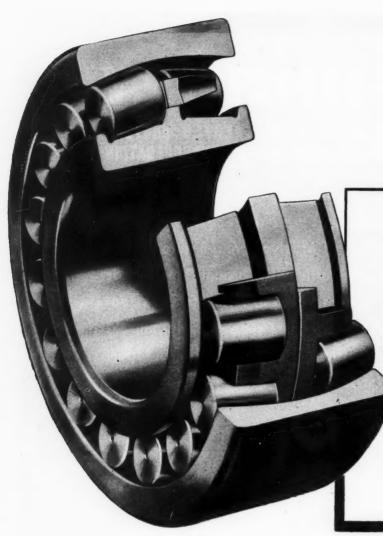


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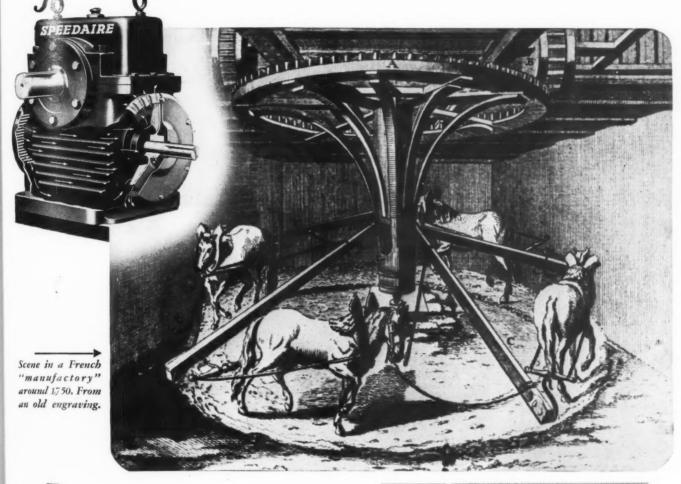
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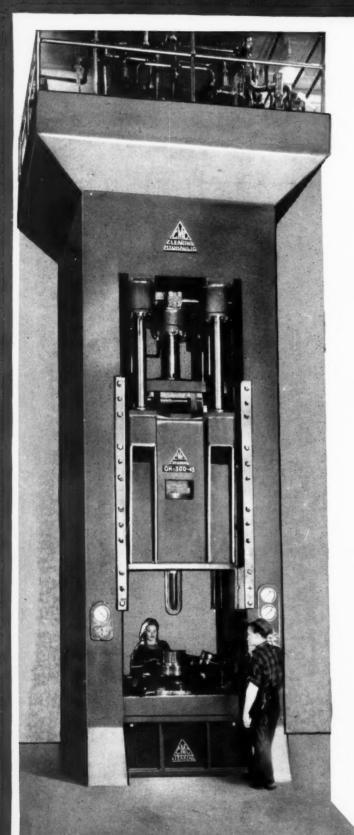
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